FINAL
Biological Assessment For the Lower Joseph Creek Restoration Project 2015

Prepared by

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INTRODUCTION

The purpose of this Biological Assessment (BA) is to initiate consultation on the ***Lower Joseph Creek Restoration Project*** (LJCRP). The LJCRP area is located primarily within the Upper Joseph Creek and Lower Joseph Creek watersheds in Wallowa County, Oregon (Figure 1).The LJCRP area is within the area of the Lower Joseph CreekWatershed Assessment (2014).This consultation is only for actions described within on Forest Service administered lands.

CONSULTATION DURATION REQUESTED

Consultation for the life of the project is requested. Project life is anticipated to be 10 years.

ENVIRONMETAL BASELINE

The following is a description of the environmental baseline for the LJCRP including a description of the watersheds and physical and biological environment found within the watersheds. See Table 1 below for a summary of watershed and subwatershed information and Figure 5 for the location of thewatersheds and subwatersheds in the LJCRP.

The LJCRP is located primarily within 10 subwatersheds; six of which are located within the Lower Joseph Creek watershed and four of which are located within the Upper Joseph Creek watershed.

Table 1. Watersheds and subwatersheds of the LJCRP.

Watershed Name/Number	Subwatershed Name/Number	SWS Acres (Total)	Project Area Acres w/in SWS	Project Area FS Acres w/in SWS	Other SWS Acres (Private, State & BLM)
Lower Joseph Creek 1706010606	Horse Creek/ 170601060605	12,341	12,337	5,770	Private 6,286 Vale BLM 275 Washington 6
Lower Joseph Creek 1706010606	JosephCr.-Rush Creek/ 170601060602	20,484	2,0482	5,670	Oregon 639 Private 12,800 Vale BLM 1,373
Lower Joseph Creek 1706010606	Lower Cottonwood Creek/1706010 60606	14,991	14,992	6,709	Private 7,318 Vale BLM 709 Washington 256
Lower Joseph Creek 1706010606	Upper Cottonwood Creek/1706010 60603	13,509	13,508	12,248	Private 1,259 Vale BLM 0.18
Lower Joseph Creek 1706010606	Broady Creek/1706010 60604	13,561	13,559	10,268	Private 2,847 Vale BLM 444
Upper Joseph Creek 1706010605	Davis Creek./ 170601060506	10,759	10,621	7,950	Private 2,671
Upper Joseph Creek 1706010605	Joseph Creek Cougar Creek/ 170601060508	13,431	13,429	1,280	Private 450
Upper Joseph Creek 1706010605	Joseph Cr-Sumac Creek/1706010 60504	11,115	11,085	9,594	Private 1,491
Upper Joseph Creek 1706010605	Lower Swamp Creek/1706010 60507	21,914	21,824	14,877	Oregon 1 Private 6,945

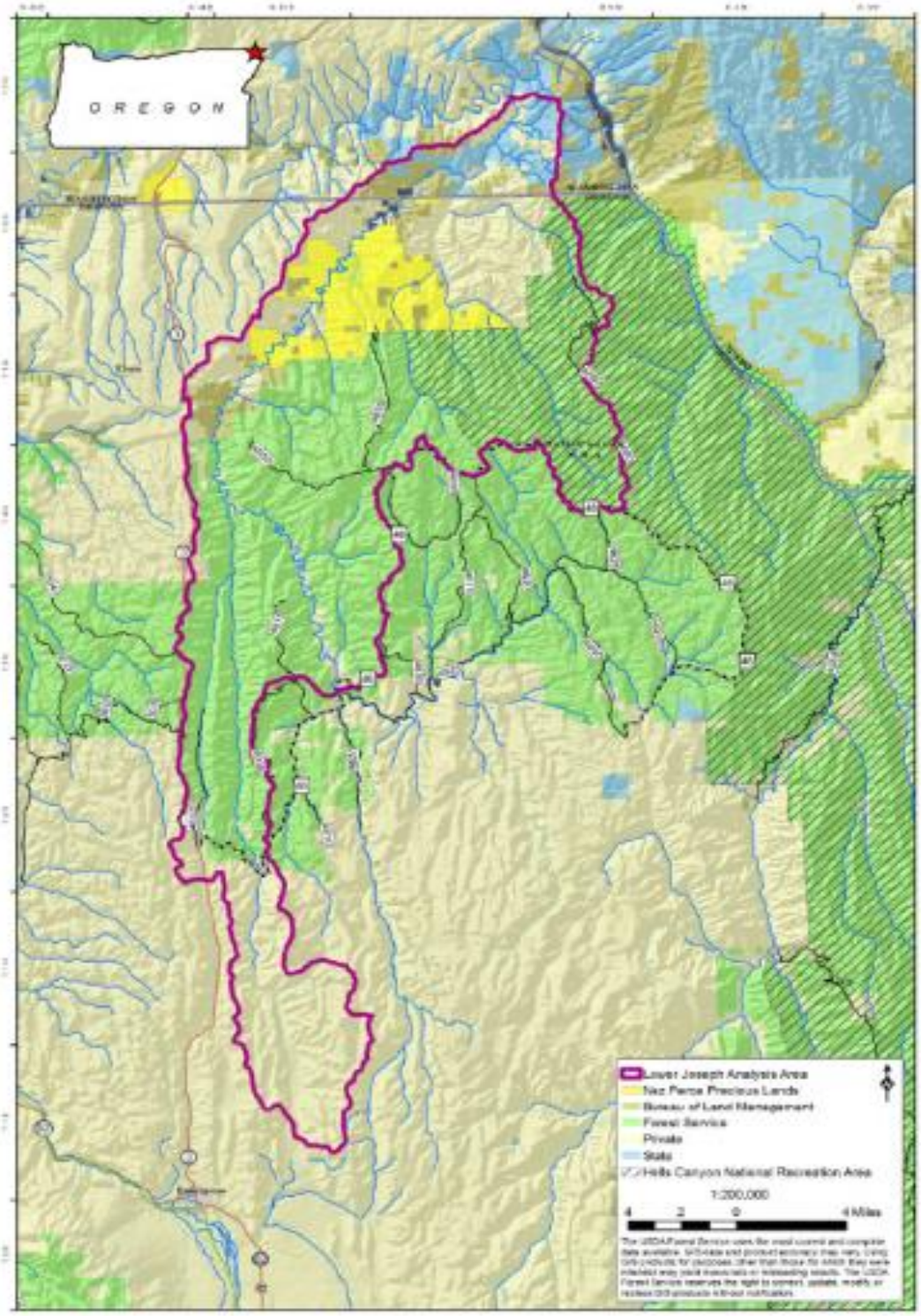
Within the LJCRP area are six culverts that are partial or full barriers to the upstream migration of steelhead and redband trout. The culverts are described in the Table 1A below. Anticipated affected area downstream of any culvert replacement is approximately 0.5 miles and 100 feet upstream. At all sites the upslope affected area extends 300 feet from the water's edge. These distances are the outer limit to where the effects of the culvert replacement action would be expected to occur.

Table 1A. Salmonid fish species and age class blocked by culverts and miles of habitat blocked.

Stream Name Location	FS Road Number	Fish Species	Adult/Juvenile Passage Barrier	Miles of Habitat Blocked
Broady Creek	4600505	ST,RT	juvenile and adult	3.0
WF Broady Creek	4600505	ST,RT	juvenile and adult	2.5
WF Broady Creek Trib	4600505	ST,RT	juvenile and adult	0.5
EF Broady Creek	4600505	ST,RT	juvenile and adult	2.0
Davis Creek	4602120	ST,RT	juvenile and adult	3.5
Sumac Creek	4600190	ST,RT	juvenile and adult	1.0

ST=Steelhead, RT=redband trout

Figure 1.Location of the LJCRP.



Map 1: Location of the Lower Joseph Creek Restoration Project (LJCRP)

Riparian Habitat Conservation Areas

The Riparian Habitat Conservation Areas (RHCA) as defined by PACFISH (1995) are as follows:

- 300 feet on each side of Category 1-fishbearing streams (600 feet total RHCA width)
- 150 feet on each side of Category 2-non-fishbearing perennial streams (300 feet total RHCA width) and wetlands greater than one acre.
- 100 feet on each side of Category 4-non-fishbearing intermittent streams (200 feet total RHCA width) and wetlands less than one acre.

The total acres of RHCAs in each of the three categories are displayed by subwatershed within the Upper and Lower Joseph Creek watersheds in Tables 2 and 3, respectively. There is limited stand data on RHCAs in the project area. Some information exists on Category 4 RHCAs but is limited to the adjacent upslope stand information. For the LJCRP the assumption is that for Category 4 RHCAs the stand data for the adjacent stand would be very similar to the RHCA vegetation.

Table 2.Acres of RHCA category by subwatershed within the Upper Joseph Watershed

Subwatershed Name	Category I RHCAs (acres)		Category 2 RHCAs (acres)		Category 4 RHCAs (acres)		Total RHCAs (acres)	
	Total	FS	Total	FS	Total	FS	Total	FS
Broady Creek	875	587	143	143	1,407	1,085	2,425	1,815
Horse Creek	713	411	132	47	2,356	1,115	3,201	1,573
Rush Creek	1,174	108	464	215	2,178	552	3,816	875
Lower Cottonwood Creek	867	169	224	173	1,583	816	2,674	1,158
Upper Cottonwood Creek	806	716	130	130	2,179	1,996	3,115	2,842
Peavine Creek	997	643	166	166	1,698	1,276	2,816	2,085
Total:	**5,432**	**2,634**	**1,259**	**874**	**11,401**	**6,840**	**18,092**	**10,348**

Table 3. Acres of RHCA category by subwatershed within the Lower Joseph Watershed

Subwatershed Name	Category I RHCAs (acres)		Category 2 RHCAs (acres)		Category 4 RHCAs (acres)		Total RHCAs (acres)	
	Total	FS	Total	FS	Total	FS	Total	FS
Cougar Creek	869	713	155	155	1,596	1,578	2,620	2,446
Sumac Creek	826	293	152	134	1,032	945	2,010	1,372
Lower Swamp Creek	1,550	1,144	137	113	2,667	1,822	4,354	3,079
Davis Creek	883	715	0	0	1,205	907	2,088	1,622
Total:	**4,128**	**2,865**	**444**	**402**	**6,500**	**5,252**	**11,072**	**8,519**

Transportation System

The transportation system in the LJCRP area is comprised of a combination of native surface roads, roads that are rocked with either pit run or gravel and some paved segments. The following tables display the road density by subwatershed, the number of stream crossings and the number of miles of roads in RHCAs by subwatershed for the existing condition in the project area. The total road density for Lower Joseph Watershed is 2.14 miles/square mile and the total road density for Upper Joseph Watershed is 2.18 miles/square mile.

Table 4. Total Road Densityby subwatershed within the Upper Joseph Watershed for FS lands

Subwatershed Name	Existing Condition	
	Total Roads	Total Rd Density
Broady Creek	53.0	3.30
Horse Creek	18.2	2.01
Rush Creek	24.1	2.71
Lower Cottonwood Creek	7.2	0.68
Upper Cottonwood Creek	25.8	1.35
Peavine Creek	26.3	1.49
Watershed Total:	**154.6**	**2.18**

Table 5. Total Road Density by subwatershed within the Lower Joseph Watershed for FS lands

Subwatershed Name	Existing Condition	
	Total Roads	Total Rd Density
Cougar Creek	54.1	2.67
Sumac Creek	46.6	3.11
Lower Swamp Creek	41.8	1.80
Davis Creek	30.8	2.48
Watershed Total:	**173.3**	**2.14**

Table 6. Total Stream Crossingsby subwatershed within the Upper Joseph Watershed for FS lands

Subwatershed Name	Existing Condition	
	Total Roads	Total Crossings
Broady Creek	53.0	74
Horse Creek	18.2	87
Rush Creek	24.1	8
Lower Cottonwood Creek	7.2	3
Upper Cottonwood Creek	25.8	29
Peavine Creek	26.3	10
Watershed Total:	**154.6**	**211**

Table 7. Total Stream Crossings by subwatershed within the Lower Joseph Watershed for FS lands

Subwatershed Name	Existing Condition	
	Total Roads	Total Crossings
Cougar Creek	54.1	63
Sumac Creek	46.6	95
Lower Swamp Creek	41.8	78
Davis Creek	30.8	44
Watershed Total:	**173.3**	**280**

Table 8. Total Miles of Road in RHCAsby subwatershed within the Upper Joseph Watershed for FS lands

Subwatershed Name	Existing Condition	
	Total Roads	Total Roads in RHCAs
Broady Creek	53.0	10.4
Horse Creek	18.2	13.7
Rush Creek	24.1	18.8
Lower Cottonwood Creek	7.2	9.1
Upper Cottonwood Creek	25.8	3.3
Peavine Creek	26.3	4.2
Watershed Total:	**154.6**	**59.5**

Table 9. Total Miles of Road in RHCAs by subwatershed within the Lower Joseph Watershed for FS lands

Subwatershed Name	Existing Condition	
	Total Roads	Total Roads in RHCAs
Cougar Creek	54.1	8.9
Sumac Creek	46.6	16.0
Lower Swamp Creek	41.8	21.1
Davis Creek	30.8	8.9
Watershed Total:	**173.3**	**54.9**

Fish Species and Distribution

Species Status – Snake River Basin Steelhead

The listed Distinct Population Segment (DPS) includes all natural-origin populations of anadromous steelhead in the Snake River basin downstream from long-standing barriers as well as six hatchery stocks.The steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with these steelhead

Although steelhead numbers have dramatically increased, natural-origin steelhead comprise only 10% to 30% of the total returns since 1994 (FPC 2013a). Consequently, the large increase in fish numbers does not reflect a change in steelhead status; the long-term trend for this species indicates a decline (McClure *et al*. 2003). Furthermore, the natural-origin abundance and productivity are still below their targets. Population-level natural-origin abundance and productivity inferred from aggregate data indicate that the Snake River Basin steelhead DPS remains likely to become endangered (Ford 2011).

The ICBTRT identified 25 historical populations in five MPGs (ICBTRT 2007; Ford 2011). The Grande Ronde River MPG includes four independent populations: Upper Grande Ronde, Lower Grande Ronde, Joseph Creek, and Wallowa River. According to the ICBTRT (2007), these northeast Oregon populations formed a group as a result of shared habitat conditions, genetic characteristics that indicate similarity between the populations and divergence from populations in other MPGs, and geographic separation from populations in tributaries which enter the Snake River downstream and upstream from the Grande Ronde River (NMFS 2012).

ICBTRT (2007) determined that the Joseph Creek steelhead population currently meets the viability criteria. The population's overall viability rating is Highly Viable, with an abundance/productivity rating of very low risk and a spatial structure/diversity rating of low risk. The 10-year geometric mean abundance of natural-origin spawners is 2,186 with is 4.4 times the minimum abundance threshold of 500 spawners. The 10 year geometric mean productivity (1.94 R/S) is above the 1.49 R/S required at the minimum abundance threshold for a risk of extinction less than 1 percent over 100 years.

ESA listed fish species and habitat within the project area include:

- Spawning and rearing habitat and designated critical habitat (DCH) for Snake River summer steelhead (*Oncorhynchus mykiss*). The National Marine Fisheries Service (NMFS) published a final rule listing steelhead in the Snake River ESU as a threatened species under the ESA listed as threatened on August 11, 1997. This ruling became final on October 17, 1997. Critical habitat for steelhead in the Snake River and Mid-Columbia evolutionary significant units was designated September 2, 2005 and became effective January 2, 2006.

There is approximately 125 miles of Endangered Species Act (ESA) listed fish bearing stream within the project area. Miles of ESA listed fish bearing streams by subwatershed are as follows:

- 12.2 miles in Broady Creek subwatershed (Broady, EF Broady, WF Broady);
- 9.9 miles in Horse Creek subwatershed (Horse Creek);
- 9.4 miles in Lower Cottonwood Creek subwatershed (Cottonwood, Basin);
- 10.0 miles in Peavine Creek – Joseph Creek subwatershed (Joseph, Peavine, Lupine);
- 16.5 miles in Rush Creek – Joseph Creek subwatershed (Joseph, Rush, Tamarack) ;
- 9.4 miles in Upper Cottonwood Creek subwatershed (Cottonwood Creek);
- 12.1 miles in Cougar Creek – Joseph Creek subwatershed (Joseph, Cougar, Aspen);

- 12.3 miles in Davis Creek subwatershed (Davis);
- 21.7 miles in Lower Swamp Creek subwatershed (Swamp);
- 11.5 miles in Sumac Creek-Joseph Creek subwatershed (Joseph, Sumac).

Designated Critical Habitat for Snake River Steelhead are found in Figure 2 and Figure 3 for steelheaddistribution and designated critical habitat within the project area.See Table 4 for miles of spawning and rearing habitat and miles of DCH within the project area by stream.

Table 10. Miles of distribution and designated critical habitat by stream for listed fish species within the LJCRP area.

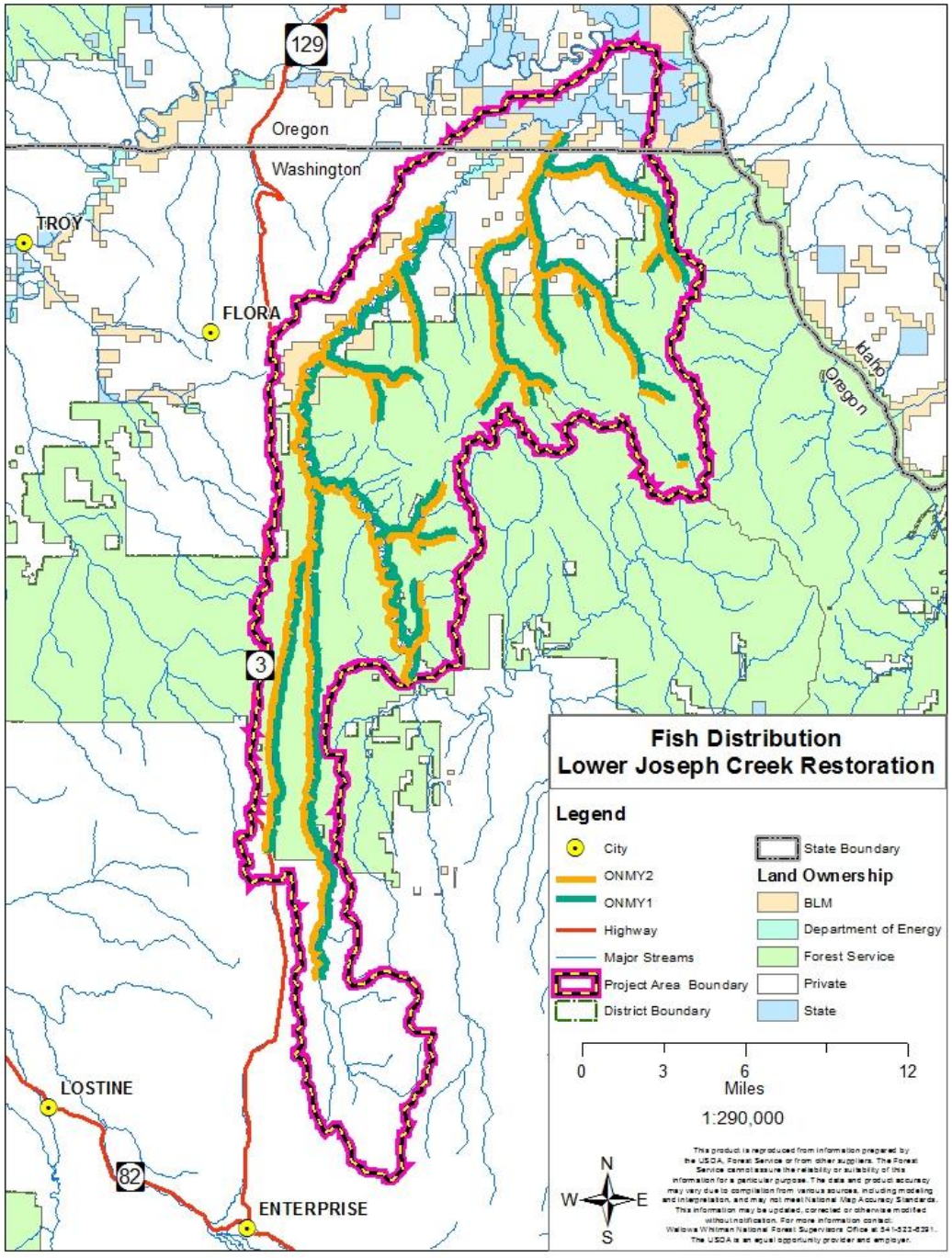
Subwatershed Name	Steelhead Habitat (Miles)		
	S/R	R	DCH
Broady Creek	12.2	12.2	12.2
Horse Creek	9.9	9.9	9.9
Lower Cottonwood Creek	9.4	9.4	9.4
Peavine Creek – Lower Joseph Creek	10.0	10.0	14.0*
Rush Creek – Jospeh Creek	16.5	16.5	16.5
Upper Cottonwood Creek	9.4	9.4	9.4
Cougar Creek	12.1	12.1	12.1
Davis Creek	12.3	12.3	12.3
Lower Swamp Creek	21.1	21.1	21.7
Sumac Creek – Joseph Creek	11.5	11.5	11.5
TOTALS			**129**

DCH=Designated Critical Habitat.
Steelhead DCH: Includes occupied habitat.
S/R=spawning and rearing habitat
R=rearing habitat only
***4 miles of DCH above a barrier**

Steelhead Density Estimates

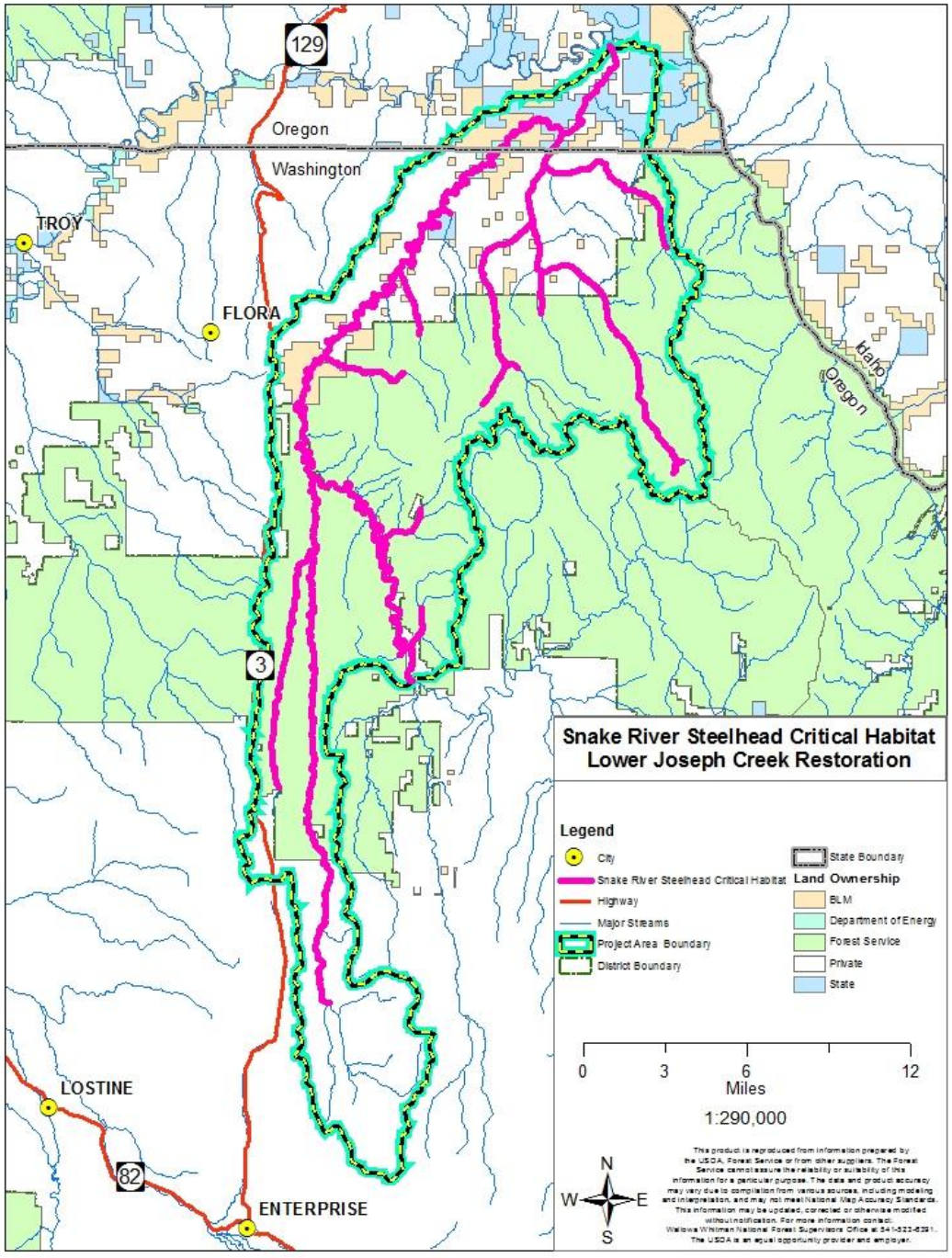
Adult steelhead could be present at the project location from mid-February to mid-May, and juveniles could use the project area year-round if summer temperatures and water levels are suitable. StreamNet identifies Sumac, Broady, WF Broady and Davis Creeks as spawning and rearing habitat for summer steelhead (StreamNet 2014). Based on data from a StreamNet query of the smolt density database ran in 2007, Sumac Creek smolt densities are expected to be approximately 0.07 steelhead /100 feet^2, Davis Creek steelhead densities are expected to be approximately 0.28 steelhead /100 feet^2, Broady Creek steelhead densities are expected to be approximately 0.46 steelhead/100feet2; EF Broady Creek densities are expected to be approximately 0.06 steelhead/100 feet2and WF Broady Creek steelhead densities are expected to be approximately 0.06 steelhead/100 feet2, and Trib to WF Broady Creek are expected to be approximately 0.06 steelhead/100 feet2.. However, since up to a quarter of the parr could survive to become smolts, steelhead parr densities in the action area could be four times the reported smolt densities.

Figure 2 Fish distribution, Snake River Steelhead and Redband Trout, within the LJCRP area.



ONMY2 = Snake River Steelhead; ONMY1 = Redband Trout

Figure 3. Designated Critical Habitat for Snake River Steelhead in the LJCRP area.



Stream Habitat and Water Quality

Table 11 shows the results of fish habitat surveys for those streams that have had habitat surveys completed within the LJCRP. This information was obtained from the Region 6 stream survey database and surveys are on file at the La Grande Ranger District, Wallowa-Whitman National Forest. Surveys within the analysis area were completed between 1992 and 2005. Survey information was collected utilizing the Hankin and Reeves methodology as modified by the PNW R6 Regional Office. Surveys from the early 1990s may not represent current habitat conditions within streams, but does provide information on the general character of streams. The number of pieces of large wood has likely increased since the early 1990s leading to an increase in the number of pools per mile due to additional large wood recruitment. The number of pieces of large wood has likely increased since the early 1990s. Pools per mile could have potentially increased due to the additional large wood recruitment creating additional pools due to scour.

Table 11. Results of aquatic habitat surveys for streams within the LJCRP.

Stream/Year Surveyed	Survey Length (miles)	Pools (#/mile)	%Fine Sediment (<64mm)	Stable Banks (%)	Width /Depth Ratio	Large Woody Debris (LWD) (pcs/mi)
Swamp Creek(2004)	15.44	8	79.5	78	22.1	6
Davis Creek (1995)	6.92	26	ND	95	9.9	67
Joseph Creek(2005)	5.8	3	80	ND	16.8	<1
Broady Creek (1992)	6.55	23	ND	ND	15.7	101
EF Broady Creek(1997)	3.14	34	53.7	99	6.6	113
Cottonwood Creek (1994)	7.15	29	ND	95	16.3	76
Cougar Creek (2005)	2.86	55	80	95	19.6	2
Peavine Creek (1998)	1.74	25	68.8	ND	10.9	7

ND=No Data

Pool Frequency

All streams surveyed were well below the PACFISH RMO for pools/mile (96 pools/mile for streams with wetted width of 10 feet) at the time of the survey.

Water Temperature

Nine stream temperature monitoring sites are located within the LJCRP area (Table 12). Years missing can be attributed to an error in the data resulting in unusable information or the site was not monitored that year.

Table 12. Results of stream temperature monitoring within the LJCRP area.

Location	Maximum Weekly Average Temperature (F^o)								
	2004	2005	2006	2007	2008	2009	2010	2011	2012
Upper Davis Creek							63.9	63.3	
Lower Davis Creek							59.7	57.6	68.5
Swamp Creek @ FS Bndry		64.2	66.0	65.8	63.3				66.6
Swamp Creek @ Bennett Pasture	67.8	67.8		68.5	65.3				
Swamp Creek @Ford (WG5)	73.9	73.2	77.2	74.7	70.9	72.9		70.9	
Joseph Creek						81.0		79.0	82.2
Cougar Creek						62.1	61.9		
Broady Creek below WF								58.6	59.5
Elk Creek @ Bridge (below Gould Gulch)	66.6	63.9	66.7	66.0	63.3	65.1	64.8	64.2	66.9

The Oregon Department of Environmental Quality (ODEQ) state water quality standard is based on the maximum 7-day running average. Temperature standards were developed based on temperature requirements of salmonids during different seasons and life stages.

The 7-day average temperature in Upper Davis and Lower Davis Creek remained below the 18° C/64.4° F standard for the period of record. The two sites on upper Swamp Creek remain at or slightly elevated above the standard and the site at lower Swamp Creek is consistently elevated above the standard for the period of record. Joseph Creek has record elevated temperatures of at least 15 degrees above the standard. Cougar and Broady Creek are consistently below the standard.

Bank Stability

Four of the eight streams surveyed meet the PACFISH RMO of > 90% stable streambanks (Table 11). One stream (Swamp Creek) approaches the RMO for bank stability with 78% stable streambanks. There is no streambank stability data for three streams surveyed.

Width to Depth Ratio

Of the eight streams surveyed within the project area, seven streams met or exceed the PACFISH width to depth ratio of <10 (Table 11). The width to depth ratios for the remaining eight streams surveyed within the project area exceeded the PACFISH width to depth ratio of <10. One stream (EF Broady Creek) is below the PACFISH RMO (6.6).

Large Woody Debris (LWD)

Four of the eight streams surveyed within the project area exceeded the standard of > 20 pieces of large wood per mile. Four streams, Swamp Creek, Joseph Creek, Cougar Creek, and Peavine Creek had less than 20 piecesof large wood per mile (Table 11).

Potential Vegetation Groups within the LJCRP Area

Potential vegetation groups (PVGs) of the LJCRP are almost equally split between grasslands and forests. Approximately 75% of the forests are dominated by the dry upland forest PVG, and 25% by the moist upland forest PVG. Dry upland forests are located at low to moderate elevations, and were historically dominated by ponderosa pine and Douglas-fir cover types. Cover types[1] classify existing vegetation composition (Eyre 1980, Shiflet 1994), reflect majority or plurality tree species abundance, and apply to both pure and mixed stands. Compared to RV estimates, ponderosa pine is underrepresented in the dry PVG, while Douglas-fir, grand fir and lodgepole pine are overrepresented. In the moist PVG, lodgepole pine is underrepresented and Douglas-fir and grand fir are overrepresented. All other cover types are within RV estimates.

Dry upland forests were historically characterized by predominantly frequent, low severity surface fires occurring at intervals of less than 20 to 25 years (Barrett et al. 1997). While larger-diameter, old trees typically survived these low severity fires, younger, smaller-diameter trees and less fire-tolerant species were killed. The historical fire regime created and maintained a generally open forest structure, with a small-scale mosaic pattern of clumps or patches of trees dominated by large diameter, old ponderosa pines, scattered individual trees, and openings that contained an abundance of native grasses and shrubs (Franklin et al. 2008, Larson and Churchill 2012, Churchill et al. 2013). This spatial heterogeneity is a key structural element of the historical dry upland forest (Franklin et al. 2008). Crown fires may have occurred historically in mid- to late-seral closed canopy structural stages. However, these events were limited in extent due to the predominance of open canopy forest (Barrett et al. 2010). The frequent fires in the dry upland forest potential vegetation group also contributed to relatively low fuel loadings.

The moist upland forest PVG is dominated by Douglas-fir, western larch, western white pine, grand fir, and sub-alpine fir, and generally located at moderate elevations. It is characterized by mixed-severity fires occurring every 40 to100 years. In a mixed-severity fire regime, fire severity ranges from stand-replacing crown fires that kill greater than 75% of overstory leaf cover to nonlethal, low-intensity surface fires that kill less than 25% of the overstory, or lack of fire that leave patches of living trees (e.g., as can currently be seen along parts of Cold Springs road). According to Perry et al. (2011), mixed-severity fires create a patchiness of forest structure, composition, and seral status that can be observed and quantified at an intermediate or meso-scale, with patch sizes ranging from a few hundredths up to tens or hundreds of acres, depending on locale and climatic drivers. Hessburg et al. (1999) measured patch sizes of uniform structure and composition from historic aerial photography from the 1930s for the ecological subregion including the LJCRP, and found patch sizes for moist (and dry) upland forests to range from approximately 10 to 600 acres. While forest management likely had affected vegetation pattern by the 1930s, it is the best source of data available on historic forest pattern. In forest types that were historically dominated by mixed-severity fire regimes, surface and canopy fuels, topography, climatic conditions, and ignitions worked in concert to influence variation in fire frequency, severity, spatial extent, and seasonality. The result was a complex spatial-temporal mix of low, moderate, and high severity patches. Due to patterns of burning, this type of historical fire regime created a complex mosaic pattern across the landscape, resulting in high levels of diversity in both plants and animals (Perry et al. 2011).

[1] For the LJCRP, cover types were calculated using a three-step process described in Powell (2004, page 14).

Table 13. Current forest cover type distribution for the LJCRP, and the natural range of variation in cover types for the Blue Mountains

Potential Vegetation Group	Cover Type	Acres	Percentage of Potential Vegetation Group	Range of variation (%) (Powell 2010)
Dry upland forest (UF)	Ponderosa pine	11,921	28%	50-80
Dry upland forest (UF)	Douglas-fir	21,773	51%	5-20
Dry upland forest (UF)	Western larch	572	1%	1-10
Dry upland forest (UF)	Lodgepole pine	217	1%	0
Dry upland forest (UF)	Grand fir	7,464	18%	1-10
Dry upland forest (UF)	Engelmann spruce	22	0%	0
Dry upland forest (UF)	Unknown	438	1%	
Dry UF Total		42,407	100%	
Moist upland forest (UF)	Ponderosa pine	1,428	11%	5-15
Moist upland forest (UF)	Douglas-fir	5,878	45%	15-30
Moist upland forest (UF)	Western larch	583	4%	10-30
Moist upland forest (UF)	Lodgepole pine	219	2%	25-45
Moist upland forest (UF)	Grand fir	4,653	36%	15-30
Moist upland forest (UF)	Engelmann spruce	133	1%	1-10
Moist upland forest (UF)	Unknown	64	0%	
Moist UF Total		12,958	100%	
Grand Total		55,365		

Livestock Grazing Allotments

There are 18 grazing allotments that overlay the LJCRP and within the Lower and Upper Joseph Creek Watersheds. These allotments are scheduled for consultation in the next 5 years. The effects of the LJCRP on grazing will be covered under the consultation for these 18 allotments.

DESCRIPTION OF PROPOSED ACTIONS

A. PURPOSE AND NEED

The Multiple-Use Sustained-Yield Act of 1960 states "It is the policy of the Congress that the National Forests are established and shall be administered for outdoor recreation, range, **timber**, watershed, wildlife, and fish purposes." The LRMP states that we are to "Provide for production of wood fiber consistent with various resource objectives, environmental requirements, and economic efficiency."

The purpose of the LJCRP is to create a more resilient landscape. Specifically the project aims to move the landscape towards a more natural range of variation by:

1. Move forested areas toward more single story stands with large old seral species trees;
2. Reduce small diameter and ladder fuels including small diameter young live trees and small diameter downed woody debris;
3. By opening forest canopy, enhance native understory plant diversity and productivity;
4. Re-establish historic grassland extent currently occupied by encroaching conifers due to fire suppression;
5. Improve fish habitat and connectivity for native fish species;
6. Reduce risk of uncharacteristic wildfire;
7. Reduce roads and other management impacts to wetlands, springs, and riparian areas; and,
8. Increase the viability of local natural resource based economy of the Wallowa County.

B. DESCRIPTION OF SITE SPECIFIC ACTIVITIES

Table 13A. Summary of Treatment Activities for LJCRP		
Total Forest Treatment Acres		**21,967**
Harvest Treatments		
Treatment Type	Single Tree Selection – High Intensity	5,126
	Single Tree Selection – Moderate Intensity	5,819
	Single Tree Selection – Low Intensity	1,275
	Single Tree Selection in MA15 – Moderate Intensity	763
	Single Tree Selection in MA15 – Low Intensity	30
	Group Selection – High Intensity	1,942
	Group Selection –Moderate Intensity	596
	Group Selection – Low Intensity	38
	Intermediate Treatment – High Intensity	124
	Intermediate Treatment – Mod Intensity	123
	Intermediate Treatment – Low Intensity	89
	Savanna*	558
	Meadow Restoration* (Swamp Creek)	31
Stand Improvement Treatments		
Treatment Type	Stand Improvement – Stands Dominated by Seedlings and Saplings	3,562
	Stand Improvement – Stands Dominated by Poles	1,891
Prescribed Fire	Total Burn Block Area	98,600
	High Priority Burn Areas	48,600
RHCA Treatments	Category 1 Treatments	31
	Category 4 Treatments	1,822
	Stand Improvement	749
Yarding Systems	Ground Based	8,787
	Skyline	5,931
	Helicopter	7,249
Road Work	Temporary Roads (miles)	12.6
	Road Decommissioning(miles)	11
	Aquatic Organism Passage Corrections	6
	Road Reconstruction/Maintenance(miles)	82.6

Forest Treatment Descriptions and Design

The descriptions of the treatment types that are proposed for the LJCRP are found in Table 9. These treatment types include forest treatments (harvest) and stand improvement treatments (precommercial thinning).

Table 14. Description of treatment types

Treatment Types	Treatment Description
Savanna	Reestablishment of grassland/forest edges and historic grasslands that have conifer encroachment.
Single Tree Selection (STS)	ICO variable density thinning within all age classes present
Group Selection (GS)	ICO variable density thinning within all age classes present; ½ to 4 acre group selection to initiate new cohort of seral species (PP/WL).
Intermediate Treatment (IT)	ICO variable density thinning within all age classes present with emphasis on isolating mistletoe infections and creating conditions that reduce intensification of infection.
Stand Improvement (SI)	ICO variable density thinning within young, post disturbance stands.
Meadow Restoration (Swamp Creek)	Reestablishment of meadow ecosystem where conifer encroachment has impacted meadow characteristics

Additional description of the silvicultural treatment types with specific design criteria based on the Individual Clumps and Openings (ICO) approach is detailed below

Design common to all GS, STS, IT and SI Treatments

Retain and release old trees.

- Retain old trees regardless of size or species. These trees are generally over 150 years old.
- Remove young trees within 1 to 2 drip-lines of old PP, WL and DF. Occasional individual large, vigorous trees may be left when they do not interfere with daylighting objective.

Shift tree composition towards fire and drought tolerant species.

- Favor ponderosa pine and western larch as leave trees in thinning operations.

Restore a mosaic spatial pattern.

- Skips – 1/10 to 1 acre no cut areas. Wet microsites, rocky outcrops, snags, thickets of seedlings/saplings, moist microsite (shade), deadwood/decadence (disturbance pocket), visual (break up viewing distance).
- Openings - .25 to 2 acres. Sinuous/amorphous shape 50-100 feet across at the widest point.
- Leave tree individuals and clumps. Using observed reference condition as guidance for ratio of individuals to clumps and the number of trees per clump (2-20+). Follow ICO approach to quantifying and restoring forest spatial pattern.

Reduce stand densities and increase mean diameter.

- Manage tree density for each density class as prescribed by treatment intensity designation using stocking chart as guidance. Overall average density would vary within this range depending on observed reference condition and existing old tree density.
- Thin from below removing trees with poor crowns (<35% live crown ratio).

- Retain young (individuals and clumps) replacement trees at a minimum density of 10 to 30 basal area per acre regardless of density class. Young tree leave trees would consist of vigorous (>35% live crown ratio) dominant and co-dominants with occasional (>45% live crown ratio) mid story and understory trees as individuals or as part of clump.

Initiate fire where and when feasible.

- Burn objectives within thinning units are to increase tree canopy base height, reduce litter/duff cover and produce effects that stimulate regeneration and growth of native herbaceous vegetation.
- Prescribed burns are designed to maintain and enhance desired forest structure, tree densities, snag densities, and CoarseWoody Debris levels.

Discriminate against dwarf mistletoe infected trees, host species for Douglas-fir mistletoe and create conditions that minimizes potential for spread to uninfected trees.

- Retention of mistletoe infected trees:
  - Old trees regardless of infection level.
  - Young trees with the lowest mistletoe infection rating when needed to meet stocking objective
- Wherever trees infected with mistletoe are left, establish a non-host or unstocked buffer of at least 50' between infected trees and uninfected residuals.

Other Miscellaneous Design

- Trees ≥21 inches DBH Alternative 2 – Grand fir, lodgepole pine and Douglas-fir trees greater than 21 inches DBH that do not meet the definition of old, may be removed in areas with a STS_High or GS treatment type when needed to
  - daylight seral species (ponderosa pine and western larch)
  - create canopy gaps of appropriate orientation and size to facilitate natural regeneration of ponderosa pine and western larch
  - reduce grand fir, lodgepole pine and Douglas-fir seed sources.
- Trees ≥21 inches DBH Alternative 3 – No trees greater than 21 inches DBH may be cut.
- Group selection treatments - No regeneration groups will be created within 100 feet of identified category 4 streams.
- Connectivity corridors – for dry forest PVG stands identified as part of a connectivity corridor, maintain an overall stand minimum canopy cover of 40%.
- Connectivity corridors – for moist forest PVG stands identified as part of a connectivity corridor, maintain an overall stand minimum canopy cover of 50%.
- Marten habitat – for stands identified as marten habitat (moist, large tree, closed canopy), maintain an overall stand minimum canopy cover of 60%.

Other Treatment Specific Design

Group Selection – Low, Moderate and High Intensity Treatments

ICO variable density thinning within all age classes present; ½ to 4 acre group selection to initiate new cohort of seral species (PP/WL)

- Uneven age thinning and group selection would be used to establish openings between individual trees and tree clumps, thin tree clumps, and create regeneration openings.
- Establish ½ to 4 acre regeneration groups within up to 20% of each GS unit. Group size and shape is dependent on extent of grand fir/Douglas-fir cohort that is being replaced, extent of available ponderosa pine/western larch seed trees, and sunlight requirement of species that is being regenerated.

Single Tree Selection - Low, Moderate and High Intensity Treatments

ICO variable density thinning within all age classes present.

- Uneven age thinning would be used to establish openings between individual trees and tree clumps, and thin tree clumps.

Single Tree Selection Old Growth – Low and Moderate Intensity Treatments

ICO variable density thinning within all age classes present.

- Retain all existing old growth characteristics as described in the WW Forest Plan MA15 description and the R6 Interim Old Growth Definition.

Intermediate Treatment - Low, Moderate and High Intensity Treatments

ICO variable density thinning within all age classes present with emphasis on isolating mistletoe infections and creating conditions that reduce intensification of infection.

- Favor non-host species as leave trees.
- Tree clumps/individuals would be managed to improve tree vigor and growth by retaining the best growing dominant and co-dominant trees with the least amount of mistletoe within each clump.
- Isolate mistletoe infected clumps or individuals with a host tree buffer of approximately 50 feet beginning at the last visible sign of infection

Stand Improvement – Seed/Sap and Pole Treatments

ICO variable density thinning within young, post disturbance stands.

- Thinning would be used to establish openings between individual trees and tree clumps, and thin tree clumps.

Savanna Treatment/Meadow Restoration Treatment

Reestablishment of grassland/forest edges and historic grasslands that have conifer encroachment.

- Restore pre-settlement tree density and pattern using pre-settlement evidence as guidance.
- Tree group arrangement, size, and density are a function of existing pre-settlement trees and evidence. Retain all old trees and the largest young trees that most closely resemble old trees in size and form as replacement trees

B 1. PROPOSED ACTION Forest Treatments

The LJCRP proposes to harvest approximatley 16,514 acres; using ground based equipment for treatment of about 2047 acres; skyline yarding equipment for treatment of about 6837 acres; and, an additional 7630 acre to be harvested with helicopter). See Figure 4 for location of timber harvest units, and Table 13A for acres of forest harvest by treatment type. Silvicultural prescriptions are found in Table 14 and the detailed description found above.

PACFISH RHCA widths will be used as minimum no activity stream buffers for forest removal activities,with the exception of the 2571 acres of RHCA treatment discussed below. PACFISH RHCAs are delineated as follows:

- 300 feet on each side of Category 1-fishbearing streams (600 feet total RHCA width)
- 150 feet on each side of Category 2-non-fishbearing perennial streams (300 feet total RHCA width) and wetlands greater than one acre.
- 100 feet on each side of Category 4-non-fishbearing intermittent streams (200 feet total RHCA width) and wetlands less than one acre.

RHCA Treatment

There are approximately 2571 acres of RHCA that are being proposed for treatment in the LJCRP. Of the 2571 acres approximately 1822acres are proposed for forest treatment to accelerate RMOs. There are 1822 acres of forest treatment proposed for Category 4 streams(Table 15 and Table 16). There are 749 acres of stand improvement treatments proposed for Category 4 streams (Table 15 and Table 16). There is one stand of 31 acres(0.50 mi of DCH)in a Category 1 RHCA proposed for forest treatment (Meadow Restoration, Swamp Creek).

Category 1 Treatment – There is one stand of 31 acres (0.50 mi of DCH) in a Category 1 RHCA proposed for forest treatment (Meadow Restoration, Swamp Creek)..The Swamp Creek RHCA Treatment unit is comprised of 31 acres(0.50 mi of DCH) located within the Category 1 RHCA that contains Swamp Creek. These acres would be treated to remove some existing shade producing trees (all trees over 15 in dbh would be left) but in the long term serve to restore the meadow storage capacity thereby reducing water exposure to direct solar radiation and reducing stream temperatures in the long term. This treatment is intended to remove conifer encroachment along the meadow ecosystem of Swamp Creek. A 25 foot variable width no treatment buffer would be used adjacent to Swamp Creek.

Category 4 Treatment - Only those Category 4 RHCAs that are not in old forest structural stage would be treated (approximately 1,822 acres). No DCH is located within the proposed treatment units in Category 4 RHCAs. Those RHCAs that are in old forest structure are assumed to be at the RMO for sediment and large wood debris recruitment. The silvicultural prescription would be similar to the upslope treatment prescription with the addition of a 25 foot variable width no treatment buffer on either side of the Category 4 stream channel. Mechanical thinning activities, skid trails, and landings would be located outside of RHCAs. Commercial thinning units will be treated using a combination of ground-based and aerial logging systems. Ground disturbing activities (i.e. yarding, development and use of skid trails and landings) would be limited to areas outside of RHCAs. Ground based equipment will be restricted within the 75 to 100 feet of the default PACFISH buffer to prevent sediment from traveling overland entering the channel and being subsequently transported downstream to fish bearing streams

Table 15. Acres of RHCA category 4 by subwatershed and proposed treatment by treatment type within the Upper Joseph Watershed by subwatershed

Subwatershed Name	Cat 4 RHCAs (acres) Total	Cat 4 RHCAs (acres) FS	Forest Treatment Cat 4 (acres)	Stand Improvem't Cat 4 (acres)	Total Cat 4 Treatment (acres)	Cat 4 Treated as % of Total Cat 4 Acres (%)	Cat 4 Treated as % of Total RHCA Acres (%)
Broady Creek	1,407	1,085	267	27	291	20.7	12.0
Horse Creek	2,356	1,115	78	66	147	6.2	4.6
Rush Creek	2,178	552	97	27	125	5.7	3.3
Lower Cottonwood Creek	1,583	816	234	58	291	18.4	10.9
Upper Cottonwood Creek	2,179	1,996	9	288	316	14.5	10.1
Peavine Creek	1,698	1,276	149	37	177	10.4	6.3
Total:	**11,401**	**6,840**	**834**	**503**	**1,337**	**11.7**	**7.4**

Table 16. Acres of RHCA category 4 by subwatershed and proposed treatement by treatment type within the Lower Joseph Watershed by subwatershed

Subwatershed Name	Cat 4 RHCAs (acres) Total	Cat 4 RHCAs (acres) FS	Forest Treatment Cat 4 (acres)	Stand Improvem't Cat 4 (acres)	Total Cat 4 Treatment (acres)	Cat 4 Treated as % of Total Cat 4 Acres (%)	Cat 4 Treated as % of Total RHCA Acres (%)
Cougar Creek	1,596	1,578	137	43	181	11.3	6.9
Sumac Creek	1,032	945	331	19	344	33.3	17.1
Lower Swamp Creek	2,667	1,822	379	15	385	14.4	8.8
Davis Creek	1,205	907	141	169	319	26.5	15.3
Total:	**6,500**	**5,252**	**988**	**246**	**1,234**	**19.0**	**11.1**

Monitoring of sale layout and contract administration will be undertaken to ensure proper application of all identified constraints and mitigating measures. Harvest units will be monitored to ensure adequate spacing between skid trails, restriction of equipment to skid trails, prevention of wet weather yarding, and effective treatment of compacted skid trails and landings.

B 2. PROPOSED ACTION Stand Improvement Treatments

A total of 5453 acres of stand improvement treatment is proposed (Figure 4). This includes 4704 acres that do not include RHCAs and 749 acres that include RHCAs, primarily Category 4 RHCAs.

Outside of RHCAs

The project proposes 4704 acres of stand improvement that do not include RHCAs. . Stand improvement may include both handwork on slopes >35% and the use of slashbusters (mastication) on slopes <35%.

Within RHCAs

A total of 749 acres of stand improvement is proposed within RHCAs. Thinning on these acres will follow the Blue Mountain PDCs where treatment within RHCAs is prescribed. Stand improvement treatments are only treating Category 4 RHCAs. No treatment is being proposed in DCH.Treatment prescriptions would follow the activity restrictions as described in Table 17 for all category streams.

Table 17. Activity restrictions for the LJCRP following the Blue Mountains Project Design Criteria

PACFISH/ INFISH Category	Fish Bearing and Designated Critical Habitat Streams	Permanently Flowing non- fish Bearing and Ponds, Lakes and wetlands > 1 acres	Seasonally Flowing or Intermittent Streams, wetlands < 1 acres, landslides and landslide-prone areas	RHCA Restrictions
Activity	**Default No Activity Buffers ***			
Thinning in RHCAs	100’	75’ on slopes < 30%	50’ on slopes < 30%	treatment by hand only (no ground based equipment) prior to treatment 500 – 2,500 stems per acre; post treatment fully stocked (generally 175 – 220 trees per acre) variable spacing all shade providing trees and long term wood recruitment trees retained only trees < 9” dbh

*RHCA restrictions are for the areas between the limited activity buffer and boundary of the full PACFISH buffer

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B 3. PROPOSED ACTIONFire/ Fuels Treatment

A total of 98,600 acres are being proposed for treatment. A total of 48,600 acres of fire/ fuels treatment is proposed in high priority areas. High priority areas are defined as forest treatment units (activity fuels) and dry forest stands not being treated by this project. The remaining acres are within grasslands and cold and moist untreated forest stands and are lower priority for prescribed fire treatment

Fire/Fuel treatment (prescribed fire)on the dry forest acres would occur when weather and fuel conditions are appropriate to meet the objectives and prescription. Prescribed burning would be accomplished within a 10 year period depending on environmental conditions needed to meet burning prescriptions. There will be no direct ignition within PACFISH RHCAs, but fire would be allowed to back into RHCAs

Outside of RHCAs

Fuels treatment outside of RHCAs includes mechanical treatment using a slash buster (mastication) and piling slash with a grapple pile machine, and use of prescribed fire in dry forest stands. PACFISH RHCA widths will be implemented as minimum no activity stream buffers.

Within RHCAs

The project proposes 1822 acres of forest treatment within RHCAs and 749 acres of stand improvement treatments within RHCAs. Only 31 acres(0.50 mi of DCH) of forest treatment with subsequent fuel treatment is being proposed in DCH Units would receive ladder and ground fuels reduction treatment involving stand improvement thinning of live trees less than nine inches dbh using chainsaws. Ladder fuels branches on trees up to six feet above ground would be pruned. Slash will be piled by hand and burned.

Fire/Fuel treatment units will follow the Blue Mountain Project Design Criteria (PDC) for specific RHCA treatments as described in Table 18. Burning activities would occur in RHCAs in accordance with Blue Mountains PDCs. The use of backing fires in RHCAs would reduce fire intensities while reducing fuel loading. Reduced fire intensities in RHCAs would 1) reduce the potential for mortality of trees that provide shade, 2) reduce the amount of downed woody material consumed, and 3) reduce the amount of burned area in the RHCAs thus reducing the amount of ground cover loss. Typically, only about 40 to 60% of the area in an RHCA is actually burned due to the use of backing fires and higher fuel moistures

Fire/Fuel treatment (prescribed burning)on the dry forest acres would occur when weather and fuel conditions are appropriate to meet the objectives and prescription. There will be no direct ignition within PACFISH RHCAs, but fire would be allowed to back into RHCAs

Figure 4. Forest Treatment units and RHCA delineation and treatment units for Lower Joseph Creek Restoration Project area.

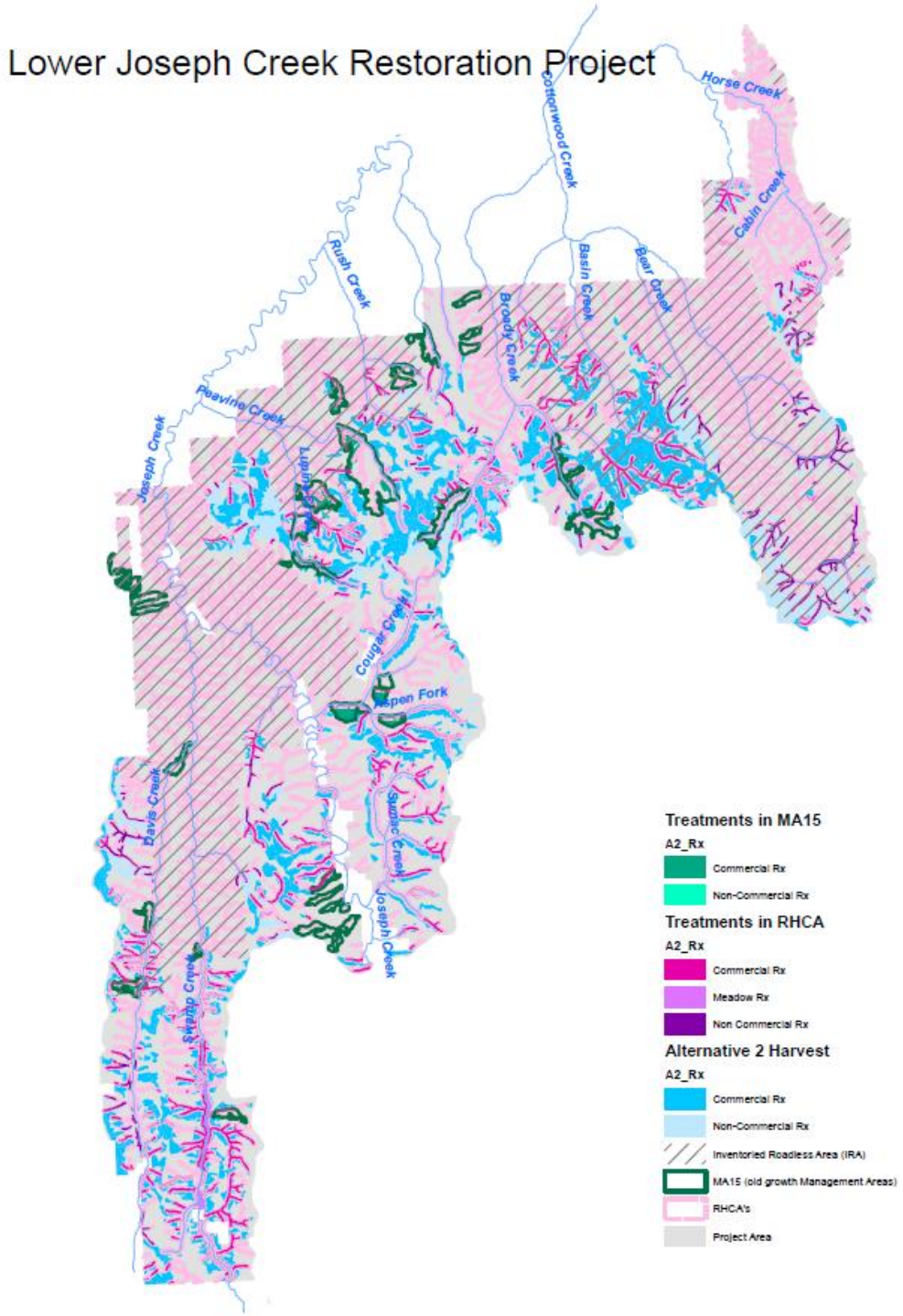

Table 18. Fire/Fuels Activity restrictions for the LJCRP following the Blue Mountains Project Design Criteria

PACFISH/ INFISH Category	Fish Bearing and Designated Critical Habitat Streams	Permanently Flowing non-fish Bearing and Ponds, Lakes and wetlands > 1 acres	Seasonally Flowing or Intermittent Streams, wetlands < 1 acres, landslides and landslide-prone areas	RHCA Restrictions
Activity	**Default Limited Activity Buffers***			
Prescribed Fire in RHCAs	100’	75’ on slopes < 30%	50’ on slopes < 30%	• treatment by hand only • all shade providing, instream and long term wood recruitment trees retained • fully stocked canopy retained • hand applied ignition (such as drip torch or fusees) within the limited activity buffer,
Slash Pile Burning	100’	75’	50’	• piles located outside the no activity RHCA buffer width and in locations to avoid damage to remaining overstory canopy • hand piling only (no mechanical treatments) • maximum size four feet in height and six feet in diameter • piles burned when there is a high soil moisture content
* RHCA restrictions are for the areas between the limited activity buffer and boundary of the full PACFISH buffer.				

B 4. PROPOSED ACTIONRoads

Temporary Roads

A total of 12.6 miles of temporary road is proposed for commercial timber removal. All temporary roads are located in uplands outside of RHCAs. All temporary roads would be built, used, and restored during the dry season and during the same season of use. After use, temporary roads will be subsoiled, ripped or scarified where appropriate, returned to original contours where needed and wood debris scattered across the footprint of the temporary road where debris is available.

Road Reconstruction/Maintenance

There is no new road construction proposed for the LJCRP. The system of roads currently on the landscape along with the use of temporary roads will provide the necessary access to facilitate proposed forest treatments

Maintenance and reconstruction of approximately 82.6 miles of the existing road system will be required. Approximately 21.4 miles of existing roads that will be maintained or reconstructed are located with RHCAs. Maintenance includes brushing, spot rocking, blading and shaping of the road surface, cross drain culvert cleaning, and limited ditch cleaning. The majority of maintenance activities such as brushing, blading and shaping of the road surface, cross drain culvert cleaning, and limited ditch cleaning will not occur instream but would occur on the road prism or immediately adjacent to the road prism.

Reconstruction may include surface rock replacement or addition, base rock addition, cross drain (culverts or dips) placement, ditch construction, and blading, and shaping of the road prism. These activities would not occur instream but will occur immediately adjacent to the road prism.

Road Decommissioning

Approximately 11 miles of road are being proposed for decommissioning. Decommissioning will be based on site specific recommendations after review of the road and its condition. Decommissioning can be complete removal of the road prism, pulling back fill material and recontouring the affected area. Decommissioning can also take the form of removal from the engineering data base and providing culvert removal. This approach to decommissioning is appropriate where the roadway has grown in with vegetation, is not within the RHCA, and shows no sign of surface erosion. Location of open, closed and decommissioned roads is shown in Figure 5. The following miles of road decommissioning by subwatershed are planned in in LJCRP area: 5.9 miles in Broady Creek subwatershed; 1.2 miles in Cougar Creek; 1.8 miles in Davis Creek; 0.3 miles in Lower Swamp Creek; 0.9 miles in Peavine Creek; and 1.4 miles in Rush Creek.

Aquatic Organism Passage

There are six culverts within the project area that are partial or complete barriers to the upstream migration of fish, creating an issue of habitat connectivity. The culverts are located on Broady Creek and tributaries (four culverts), Davis Creek, and Sumac Creek. Some level of passage is evidenced by the presence of spawning and juvenile salmonids above each culvert. However, these culverts impede passage at various times of the year through a combination of excessive gradient, undersized to pass high flows, or being “perched” above the stream surface more than 4 inches. All six culverts are proposed to be replaced.

Culverts will be removed and replaced with culverts or open bottomed arches that incorporate stream simulation through the crossing. Culvert and open bottomed arch widths will be at least bankfull width. The use of the regional Project Design Team will be to review the site prior to design, review design to assure adherence to stream simulation, debris passage, flood flows, channel stability and floodplain characteristics.

If a stream is not fully entrenched(entrenchment ratio of greater than 1.4), the minimum culvert width shall be at least 1.3 times the bankfull channel width. This isconsistent with Anadromous Salmonid Passage Facility Design (NMFS 2011).

If a stream is entrenched (entrenchment ratioof less than 1.4), the culvert width will be greater than bankfullchannel width, allow sufficient vertical clearance to allow ease of construction and maintenance activities, and provide adequateroom for the construction of natural channel banks. Considerationshall be given to accommodate the floodprone width. Floodpronewidth is the width measured at twice the maximum bankfull depth(Rosgen 1996).

D. PROJECT SPECIFIC PROTECTION MEASURES

See the Appendix for Project Design Criteria/Conservation Measures.

E. PROJECT SPECIFIC MONITORING

Pre-project monitoring for the forest treatment portions of the LJCRP includes on the ground survey of the project area, and the proposed treatment units. Monitoring of the proposed treatment units includes survey of any stream channels, RHCAs, slope stability, and general riparian vegetation characteristics.Monitoring the project will ensure that all Standards and Guidelines in the LRMP are met through implementation of protection measures as identified by the interdisciplinary team.

Monitoring of the implementation of the project and the protection measures will take place throughout the life of the project by the TSA (Timber Sale Administrator) and Watershed Specialist. For example, if an intense thunderstorm caused overland flow and subsequent excessive soil displacement or sediment production, harvest operations would cease until the soil moisture decreased or protection measures were complete. Potential effects from log haul on roads which parallel RHCAs will be monitored throughout the life of the project by the TSA and Watershed Specialist. Timber harvest operations will be halted if adverse impacts are observed at any point during the operation.

Post-project monitoring includes implementation and effectiveness monitoring to determine if applicable Best Management Practices (BMPs) and mitigation measures were effective in meeting soil and water resource protection.

Monitoring of RHCAs treatments (both forest treatments and stand improvements) will be conducted by fish and watershed personnel in concert with presale personnel, fire personnel and the TSA. Items monitored will include:

- proper implementation of no activity stream buffers

- proper implementation of Category 4 treatment variable width buffers,
- burn pile size and placement,
- fuel transects along stream buffers and through units will look for erosional features,
- fire intensity of piles burned.

Monitoring of the Category 1 RHCA treatment within Swamp Creek will consist of additional stream temperature monitoring located upstream and downstream of the treatment. These monitoring stations will be placed prior to treatment activities and collect data for a total of five years after treatment to determine any change in stream water temperature that could be attributable to the treatment.

The monitoring results will be reported to NOAA Fisheries in the annual monitoring report prepared by the Forest or subunit, as required to be submitted annually to NOAA fisheries on all activities consulted on for the current year.

ANALYSIS OF POTENTIAL EFFECTS

A. EVALUATION CRITERIA

The following is a site-specific analysis of the potential direct and indirect effects. Based on the consequence and likelihood of adverse effects from the actions, the potential risk to matrix indicators (Table 14) are rated as no risk, low, moderate, or high risk. This analysis uses the best available scientific information and site-specific professional judgment to determine potential effects.

Evaluation of effects was based on current habitat conditions, previously identified RMOs, and the Matrix of Pathways and Indicators as described in *Making Endangered Species Act Determinations of effect for Individual or Grouped Actions at the Watershed Scale (*NMFS 1996).

Table 19. Determination of Risk to Matrix Indicators for the LJCRP.

Risk of	Risk of Indirect Effects to Each Matrix Indicator *														
Direct Effects	Temp	Sed	Chem Cont	Phys Barr	LWM	Pool Freq / Qual	Off-Chan	Refug	W/D	Bank Stab	Flood plain	Road Dens	Distur Hist / Flows	RHCA	Disturb Reg
L	N	L	N	P	L	N	N	N	N	N	N	L	N	L	P

P = Positive Effect
N=No Risk
L = Low Risk
M= Moderate Risk
H= High Risk

B. DIRECT AND INDIRECT EFFECTS

This chapter analyzes the potential direct and indirect effects that the LJCRP may have on listed fish and/or their habitat. This analysis uses the best available scientific information and site specific professional judgment to determine these effects. The direct and indirect effects that this project may have on summer steelheadand designated critical habitat are analyzed.

DIRECT EFFECTS TO FISH

There will be potential direct effects to listed fish species from the implementation of theLJCRP. Two activities will have potential direct effects: 1) 31 acres of RHCA treatment (0.50 mi of DCH)

along Swamp Creek, a fish bearing stream; and 2) replacement of six culverts to improve fish passage. These activities will occur during the instream work window to minimize potential direct effects to Snake River steelhead.

Direct effects will take place in the Lower Swamp Creek subwatershed where the 31 acres of RHCA treatment will take place.

Direct effects will take place in the Davis Creek, Joseph Creek- Sumac Creek, and Broady Creek subwatersheds where replacement of six culverts will take place.

INDIRECT EFFECTS

The potential indirect effects that the project may have on listed fish species and the matrix indicators are discussed below. This discussion is based on professional judgment, site specific knowledge of the project area, past monitoring results, and research literature.

The subwatersheds listed in Table 1 are where potential effects to ESA listed fish species and Designated Critical Habitat could occur. The baseline condition, which is analyzed at the subwatershed scale, is shown in the Matrix of Pathways and Indicators (Table 20).The following abbreviations for the 10 subwatersheds are used in Table 20:

Indirect effects will take place in all subwatersheds within the LJCRP area as identified in Table 1 from the treatment of Category 4 RHCAs from both forest treatments and stand improvement treatments.

Broady Creek = **BC**
Horse Creek **= HC**
Lower Cottowood Creek **= LCC**
Peavine Creek **–** Joseph Creek **= PC**
Rush Creek – Joseph Creek **= RC**
Upper Cottonwood Creek **=UCC**
Cougar Creek –Joseph Creek **= CC**
Davis Creek **= DC**
Lower Swamp Creek **= LSC**
Sumac Creek-Joseph Creek **– SC**

Table 20. Multi species matrix for pathways and indicators showing baseline condition in the LJCRP subwatersheds and potential effects.

Diagnostic or Pathway	Properly Functioning/ Functioning Appropriately	Functioning At Risk	Not Properly Functioning/ Functioning At Unacceptable Risk	Effects of the LJCR Project		
Bull Trout Subpopulation Characteristics w/in Subpopulation Watersheds:				**Restore**	**Maintain**	**Degrade**
*Subpopulation Size	N/A					
*Growth & Survival	N/A					
*Life History Diversity & Isolation	N/A					
*Persistence & Genetic Integrity	N/A					
Water Quality:						
*Temperature *Bull Trout*	N/A					
Temperature *S/S Chinook, Steelhead*	BC,PV,RC,DC	HC,LCC,UCC,CC, LSC,SC			**X**	
Sediment/Turbidity Substrate Embedd.	HC,LCC,PC,UCC,	BC,CC,RC	DC,LSC,SC		**X**	
Chem. Contamination Nutrients	BC,HC,LCC,PC,SC RC,UCC,CC,DC ,LSC				**X**	
Habitat Access:						
Physical Barriers	HC,LCC,PC,RC, UCC,CC,LSC	BC,DC,SC		**X**		
Habitat Elements:						
Large Woody Material	BC,HC,LCC,UCC, DC	RC,LSC	CC,SC,PV		**X**	
Pool Frequency		BC,HC,LCC,DC UCC,PC	RC,LSC,SC,CC		**X**	
Pool Quality/Large Pools		BC,HC,LCC,DC UCC,PC	RC,LSC,SC,CC		**X**	
Off-channel Habitat		BC,HC,LCC,PC, SC,RC,UCC,CC DC,LSC			**X**	
Refugia		BC,HC,LCC,PC, SC,RC,UCC,CC DC,LSC			**X**	
Channel Condition and Dynamics:						
Width/Depth Ratio	BC,HC,LCC,PC, SC,RC,UCC,CC DC,LSC				**X**	
Streambank Condition	BC,HC,LCC,PC, SC,RC,UCC,CC DC	LSC			**X**	
Floodplain Connectivity	BC,HC,LCC, RC,UCC DC,LSC	PC,CC,SC			**X**	
Watershed Conditions:						
Road Density/Location Drainage	LCC,PC, UCC, LSC	DC,CC,HC RC	SC,BC		**X**	
Disturbance History Peak Base Flows	BC,HC,LCC,PC, SC,RC,UCC,CC DC,LSC				**X**	

Riparian Habitat Conservation Areas		BC,HC,LCC,PC, SC,RC,UCC,CC DC,LSC			**X**	
Disturbance Regime		BC,HC,LCC,PC, SC,RC,UCC,CC DC,LSC		**X**		
*Integration of Species and Habitat Conditions	N/A					

Habitat Indicators

Habitat Indicators that have the greatest risk of being negatively affected by this project (rated as Low in Table 11), include Sediment/Turbidity/Substrate Embeddedness, Physical Barriers, Large Woody Material, and Riparian Habitat Conservation Areas. The LJCRP will have a positive effect on two of the indicators, which arePhysical Barriers, and Disturbance Regime. This is due to overall forest treatments, fuels reduction work and stand improvementwithin RHCAs.. The baseline condition of Habitat Indicators is summarized in Table 20.

Temperature

The environmental baseline for stream temperature will be **maintained** at the current level.

The Broady Creek, Pevine Creek, Rush Creek and Davis Creek subwatersheds are all rated as Functioning Appropriately(FA) for this indicator with the remainder of the subwatersheds Functioning at Acceptable Risk (Table 20).

Forest Treatment

With the exception of the 31 acres of Category 1 RHCA treatment in Swamp Creek (discussed below), PACFISH RHCA widths will be used as no activity stream buffers for commercial removal activities and will prevent increases in stream temperatures.

Swamp Creek Category 1 RHCA Treatment Unit (31 acres)

The Swamp Creek RHCA Treatment unit is comprised of 31 acres located within the Category 1 RHCA that contains Swamp Creek. These acres would be treated to remove some existing shade producing trees (all trees over 15 in dbh would be left) but in the long term serve to restore the meadow storage capacity thereby reducing water exposure to direct solar radiation and reducing stream temperatures in the long term. This treatment is intended to remove conifer encroachment along the meadow ecosystem of Swamp Creek. A 25 foot variable width buffer would be used adjacent to Swamp Creek.

Danehy and Kirpes (2000) found that the riparian microclimate gradient on four perennial streams in the Grande Ronde Basin of eastern Oregon extended no more than10 meters (30 feet) from the edge of the stream channel into the upland forest. Beyond 10 meters humidity was similar to upland conditions.
A study conducted by Chan et al. (2004) on four different buffer widths with upland density management (thinning) suggest that riparian buffers of various configuration results in relatively small changes in the riparian climate. Buffer widths in the study were 1) streamside retention (less than 25 feet), 2) variable width (about 57 feet), 3) one site potential tree width (about 201 feet), and 4) two site potential tree widths (about 400 feet). The study involved small headwater streams, and results of the study found that the area between the stream and 15 feet lateral distance from the stream is uniquely riparian with respect to microclimate. This 15 foot zone is

remarkably resistant to microclimate changes from upland thinning treatments.

Anderson et al. (2007) studied the effects of thinning on the riparian microclimate in western Oregon. Three buffer widths (measured from stream center) were used for mechanical thinning and are: 1) streamside retention averaging nine meters (about 27 feet), 2) variable width averaging 22 meters (about 66 feet), and 3) one site potential tree height averaging 69 meters (about 207 feet). The study concluded that: riparian microclimate gradients are strongest within 10 meters of the center of the stream (about 30 feet), upslope thinning has little detectable effect on the stream center microclimate, buffer widths defined by the transition from riparian to upland vegetation or topographic slope breaks appear sufficient to mitigate the impacts of upslope thinning on the microclimate above the stream, and there was no apparent mitigation associated with wider buffers.

Treatment of the 31 acres (0.50 mi of DCH) will affect only 2.7% (0.4% of total DCH miles) of the total acres of Category 1 streams in the Lower Swamp Creek subwatershed. The retention of all trees over 15 inch dbh will retain shade producing vegetation. There will be no affect to stream temperature from the treatment of 31 acres of Swamp Creek.

Skyline Yarding

Skyline yarding units will have full suspension over RHCAs. No corridors are needed through the RHCA for removal of material since no treatment of RHCAs is proposed in the majority of skyline units. In most cases the cable can be raised without cutting trees in the RHCA. Occasionally a tree may need to be cut down to facilitate raising of the cable. Trees cut within the RHCA to facilitate raising of the cable would be left on site since there is no yarding within RHCAs. Location and amount of trees that may need to be cut for cable suspension are infrequent and scattered through the RHCA and would not be of an amount to increase stream temperature or affect water quality. Only a narrow opening is needed for cable suspension (raising of the cable) above the tree canopy of the RHCA, and in many cases natural openings are used.

There are forest treatment units utilizing skyline harvest methods proposed adjacent to both Category 1 and 2 streams.PACFISH RHCA buffer widths used as no activity stream buffers on Category 1 and 2 streams will prevent increases in stream temperature as a result of skyline yarding.

<u>Stand Improvement Treatments within and outside RHCAs</u>

The project proposes to treat 5453 acres of stand improvement of which 749 acres are within Category 4 RHCAs (no DCH). All treatment will follow the Blue Mountain Project Design Criteria as found in Table 7.

Category 4 streams within the project area are typically dry by mid June and do not contribute to summer stream temperatures and are therefore not an issue for maximum stream temperatures. No overstory trees would be removed from within RHCAs that could increase stream temperatures.

Stand Improvement within RHCAs can increase future stream shade. Typical riparian conditions such as wide spacing and mixed conifer or hardwood stands allow later crown closure than tightly packed plantations (Berg 1995). Homyack et al. (2004) found that stands thinned six to 11 years prior to the study had a greater overstory structure than similar untreated stands. In contrast,

unthinned stands gained little overstory structure indicating that the application of stand improvement was responsible for the accelerated height and diameter growth.

There are no short term effects to stream temperature as a result of handwork within RHCAs due to theno activity stream buffers that are based on the riparian microclimate, understory thinning of overstocked stands, and no overstory removal. The overstory canopy would remain intact to provide streamshade.

Prescribed Fire

A total of 98,600 acres of prescribed fire is proposed with 48,600 acres considered high priority. The high priority acres include forest treatement units (activity fuels) and dry forest prescribed fire acres.. Prescribed burning would occur when weather and fuel conditions are appropriate to meet the objectives and prescription. Prescribed burning would be accomplished within a 10 year period depending on environmental conditions needed to meet burning prescriptions. There will be no direct ignition within PACFISH RHCAs, but fire would be allowed to back into RHCAs.

A study conducted by Beche et al. (2005) found that a prescribed burn conducted in the fall with direct ignition within the riparian zone had minimal effects on a small stream and its riparian zone during the first year post-fire. The prescribed fire in the riparian zone was patchy in terms of intensity, consumption, and severity. The fire was most severe in those areas with large accumulations of conifer litter and debris, and usually self extinguished when it came in contact with moist soil and characteristic riparian vegetation. As expected, high soil and fuel moisture, and high relative humidity can reduce fire intensity and retard fire spread in riparian zones. The prescribed fire did not result in substantial riparian tree mortality. Upland only prescribed fires (ie., those prevented from entering the riparian zone) generally do not affect riparian vegetation.

Agee et al. (2002) found that understory vegetation in riparian zones tended to be moister later in the season than in drier upland forests. In low elevation, interior forests such as those with ponderosa pine, Douglas fir and grand fir, higher understory foliar moisture in riparian zones should dampen surface fire behavoir compared to upland forests late in the dry season. High foliar moisture in understory plants will be associated with lower surface fireline activities as fires approach the riparian zone, even when fire return intervals have been shown to be similar between riparian and upland sites (Olson, 2000).

The use of prescribed fire will not increase stream temperatures. There will be no direct ignition within PACFISH RHCAs, but fire will be allowed to back into RHCAs. The fire intensity is expected to be low in riparian areas (RHCAs), having little effect on riparian vegetation or the conifer overstory providing streamshade.

Temporary Roads

All temporary roads are located in uplands outside of Category 1 or 2 RHCAs and therefore will have no effect on stream temperature.

Aquatic Organism Passage

Only the vegetation within the construction area of the aquatic organism passage projects will be removed. Riparian buffers will be flagged to avoid the potential for sediment delivery and limiting stream temperature increases. Vegetation removal within the buffers will be limited in area and will not have an effect on stream temperature.

Sediment/Turbidity/Substrate Embeddedness

The environmental baseline for Sediment/Turbidity/Substrate Embeddedness will be **maintained** at the current level.

The Horse Creek, Lower Cottonwood Creek, Peavine Creek, and Upper Cottonwood Creek subwatersheds are rated as Functioning Appropriately (FA), and the Broady Creek, Cougar Creek, and Rush Creek subwatersheds are rated FAR for this indicator, with the Davis Creek, Lower Swamp Creek and Sumac Creek rated Functioning at Unacceptable Risk for this indicator(Table 15). The rating for the three FUR subwatersheds is due in part to the high fine sediment levels recorded during the aquatic inventory for the streams in the those subwatersheds and to the elevated road densities as well as location of certain roads in those subwatersheds contributing fine sediment to the downstream fish bearing streams.

Forest Treatments

The use of PACFISH RHCA buffer widths will be used as no activity stream buffers for commercial removal activities including skyline yarding, and will prevent increases in stream sediment.The Category 4 treatment acres will utilize a 25 foot variable width no treatment buffer with ground based equipment restricted within the 75 to 100 feet of the default PACFISH buffer to prevent sediment from traveling overland to enter the channel and being subsequently transported downstream to fish bearing streams. No equipment will be utilized on slopes greater than 35% to minimize sediment transport to stream channels.

Rashin et al. (2006) demonstrated the effectiveness of best management practices for controlling sediment related water quality impacts from timber harvest activities. Rashin et al.(2006) found that stream buffers were most effective where timber falling and yarding activities were kept at least 10 meters (approximately 33 feet) from streams and outside of steep inner gorges. This 10 meter buffer for ground disturbing activities was found to prevent sediment delivery to streams from about 95% of harvest related erosion features. Of 193 erosion features located 10 meters from the stream channel, 95% did not deliver sediment. In addition, Rashin et al. (2006) found that virtually all chronic sediment delivery was associated with skid and shovel trails that crossed streams.

Stand Improvement Outside of RHCAs

Stand improvement outside of RHCAs will not increase sediment yield to streams.Mechanical treatment, such as the use of a slashbuster and slash grapple pile machine, is included in activities outside of RHCAs. The use of Blue Mountain PDCs for stand improvement will prevent sediment movement to stream channels.

Stand ImprovementWithin RHCAs

Stand improvement handwork within RHCAs will notincrease sediment yield to streams or alter turbidity or substrate embeddeddness. The use of the Blue Mountain PDCs, and minimum stream buffers of 25feet on Category 4 streams will be implemented. Hand treatment includes thinning overstocked understory and ladder fuels (trees < nine inches dbh), and hand piling and burning of slash created from thinning.

Work within RHCAs would be conducted by hand, which would result in minimal ground disturbance. A study conducted by Madrid et al. (2006) evaluated three silvicultural treatments, which are 1) untreated control, 2) precommercial thin with slash piled, and 3) precommercial thin

with slash scattered. Treatments were done by hand. Fuels reduction and thinning within RHCAs in the LJCRP area similar to the treatment described in number two above, stand improvement with slash piled. Ground disturbance in the pile treatment ranged from no ground disturbance to slight roughing of the litter with slight exposure of mineral soil where slash was hauled to piles. Sediment yield was statistically different and greater on pile and scatter treatments than the untreated control or thin and pile treatments during wet runs. Median sediment yield for the untreated control was 0.36 kg ha^{-1}, thin and pile treatment was 0.83 kg ha^{-1}, and the thin with slash scattered was 0.90 kg ha^{-1}. Sediment yield for both treatments was still very low and within erosion rates of undisturbed forested watersheds. Studies have reported that undisturbed forested watersheds have erosion rates from near 0 to 560 kg ha^{-1} (Binkley and Brown, 1993). Median values modeled for both dry and simulated storm events were below 2 kg ha^{-1}. The values for thin and pile are very close to zero and well within background levels for erosion rates of undisturbed forested watersheds. Amount of sediment generated by this activity is not measurable since the values described above are very close to zero and are the background levels of natural sediment introduction in undisturbed forested watersheds. The study concluded that infiltration rates, runoff rates, and soil moisture content did not differ among treatments.

Best Management Practices monitoring on the Wallowa-Whitman National Forest supports the research findings. Mechanical treatment in RHCAs in the Starkey and Horsefly Vegetation Management Projects found that there was no offsite movement of sediment, no sediment movement through the no treatment stream buffers of 50 feet on perennial and 30 feet on intermittent streams, and no sediment yield to stream channels. These acres were treated mechanically.

Hand treatment results in minimal to no ground disturbance, does not compact soils, and would result in very small amounts of sediment that would not be measurable above back ground levels.

Hand piling and hand burning of small piles are not a source of erosion, do not create overland flow, and are therefore are not a source of sediment to stream channels. Seymour and Tecle (2004) conducted a study of the effects of burning hand piled slash on physical soil characteristics of soil bulk density, soil porosity, infiltration capacity, and soil moisture content. The size of hand piles studied were small, round hand piles 1.2 m high (3.9 feet) and 2.4 m in diameter (7.9 feet); and large hand piles 2 m high (6.6 feet), 4 m wide (13 feet), and 5 m long (16 feet). Unburned large and small hand piles and control treatments were used to measure differences in physical soil characteristics between treatments. Study results indicate that there were no significant differences in soil bulk density and porosity, soil infiltration capacity, or soil moisture between treatments. Since bulk soil density and porosity were not significantly affected, soil infiltration rates were not reduced indicating the absence of the formation of a hydrophobic layer that could lead to overland flow and erosion. Stand improvement slash hand piles within RHCAs would be similar in size to the “small” hand piles described in the study above, and average size of piles would be approximately four to five feet high and eight feet in diameter. Piles would be burned when there would be a high soil moisture content and would result in a low intensity burn to minimize effects to soils and vegetation. An inspection of small diameter Burn Piles, similar to those described above, in the South Fork Catherine WUI Project area within the RHCA of a perennial stream found good soil moisture and infiltration in the footprint of burn piles and virtually no erosion or offsite movement of sediment. It was determined that the small burn piles retained roughness and soil infiltration, and also lacked the surface area and hydrophobic soils needed to create overland flow. This verifies the results of the research described above.

Sediment yield from stand improvement and hand piling and burning of slash would be very close to zero due to minimal ground disturbance, and well within the background levels of sediment yield in undisturbed forested watersheds. Given that small burn piles are not a source of sediment, that there will be minimal ground disturbance in the RHCA,and no activity stream buffers, there will be a negligible effect to the Sediment/Turbidity/Substrate

Embeddednessindicator.There are no short term effects to stream Sediment/Turbidity/Substrate Embeddedness as a result of handwork within RHCAs since there is virtually no ground disturbance and results in a non-measurable amount of sediment to stream channels.

Prescribed Fire

Prescribed fire (burning) would occur when weather and fuel conditions are appropriate to meet the objectives and prescription. Prescribed burning would be accomplished within a 10 year period depending on environmental conditions needed to meet burning prescriptions. There will be no direct ignition within PACFISH RHCAs, but fire would be allowed to back into RHCAs.

The use of prescribed fire would not increase sediment delivery rates to stream channels over and above the natural sediment rates of the subwatershed. The fire intensity is expected to be low in riparian areas, having little effect on riparian conditions. Prescribed fire is not expected to be a source of erosion or sediment delivery.

Agee et al. (2002) found that understory vegetation in riparian zones tended to be moister later in the season than in drier upland forests. In low elevation, interior forests such as those with ponderosa pine, Douglas fir and grand fir, higher understory foliar moisture in riparian zones should dampen surface fire behavoir compared to upland forests late in the dry season. High foliar moisture in understory plants will be associated with lower surface fireline activities as fires approach the riparian zone, even when fire return intervals have been shown to be similar between riparian and upland sites (Olson, 2000).

Control lines would include roads, natural barriers (rock outcrops, rock bluffs, rocky scabs etc.), and brush removal rather than bare mineral soil line construction where possible. No control lines are required within RHCAs.

For prescribed fire, no direct ignition within RHCAs, moist characteristics of riparian zones, and burning when weather and fuel conditions are appropriate would result in a negligible effect to the Sediment/Turbidity/Substrate Embeddedness indicator.

Temporary Roads

Since temporary roads are located in uplands outside of RHCAs, no measurable sediment delivery will produced.

Road Maintenance and Reconstruction

Maintenance and reconstruction of roads may be required. Maintenance includes brushing, spot rocking, blading and shaping of the road surface, cross drain culvert cleaning, and limited ditch cleaning.

The majority of maintenance activities such as brushing, blading and shaping of the road surface, cross drain culvert cleaning, and limited ditch cleaning would not occur instream but would occur on the road prism or immediately adjacent to the road prism.

Road maintenance and reconstruction can reduce sediment delivery to stream channels through improved drainage and reduced erosion of the road surface by directing water off of the road surface. Road maintenance is necessary to keep roads in good condition, minimize erosion, and identify and correct problems promptly (Furniss et al. 1991). Maintenance keeps roads in a condition suitable for travel and prevents severe erosion from failure of the drainage system (Luce and Black 2001).

Blading consists of pulling material from the sides of the road inwards to redevelop the road crown. All material would remain on the road surface. Luce and Black (2001) observed that blading of only the traveled roadway on an aggregate surfaced road with well vegetated ditches yielded no increase in sediment production from a complete road segment, while blading of the ditch, cutslope, and traveled roadway substantially increased sediment yield from road segments. Results from a study conducted by Luce and Black (2001) suggest that blading the ditch has a greater effect than traffic on sediment yield, and that ditch grading can increase sediment yields on a level comparable to or greater than wet weather hauling. Cleaning ditches and removing the cutslope vegetation caused a dramatic increase in sediment production. Sediment yields from older roads with undisturbed ditchlines are much smaller than sediment yields from newer roads or roads with disturbed ditchlines. Disturbance of the road surface alone through grading showed less effect. No widespread ditch cleaning is proposed. Some small scale, local, and scattered ditch cleaning may be needed. The majority of vegetated ditchlines would remain to trap sediment before reaching streams.

Brushing out of the road prism would not cause ground disturbance. Vegetation is trimmed back approximately six feet either side of the traveled roadway.

Spot rocking will prevent rutting, erosion and puddling of the road surface. Swift (1984) investigated the influence of graveled, ungraveled, and grassed road surfaces on soil erosion. The study concluded that the graveled road surface with vegetated sideslopes have the lowest soil loss compared to ungraveled and grass road surfaces.

Ground disturbance from maintenance and reconstruction adjacent to the perrenial streams would result in a short term increase (< one year) in sediment yield that will be trapped and retained in the small headwater streams. In the long term (> one year) soils would begin to revegetate and stabilize. This is based on a road decommissioning study with ground disturbance adjacent to streams.

Implementation of Conservation Meaures (see the Appendix) would minimize indirect effects to water quality as a result of culvert replacement (aquatic organisim passage). Conservation Measures include:

- delineating construction impact areas on project plans and confining work to the noted area;
- conducting during dry conditions;
- install sediment controls before initiating surface-disturbing activities to the extent practical;
- minimize heavy equipment entry into or crossing water as is practicable;
- minimizing vegetation removal, ground disturbance, and streambank excavation;
- establishing designated areas for equipment staging and stockpiling of materials;
- keeping excavated materials out of the waterbody;
- properly compact fills to avoid or minimize erosion;
- contour site to disperse runoff, minimize erosion, stabilize slopes, and provide a favorable environment for plant growth;
- mulching and seeding disturbed soils with native grasses.

A pollution control plan (PCP) would be used to protect water quality or respond to toxic spills that could threaten water quality.

Roads will be used only under dry or frozen conditions to minimize sedimentation to stream channels. Prohibition of wet weather haul is an increasingly common best management practice that is effective in reducing sediment production from existing roads (Luce and Black 2001).

Some types of impacts can be avoided simply by keeping people off roads during part of the year. This approach has been taken to decrease road surface erosion rates during wet weather (Reid et al. 1994).

The degree of sedimentation to stream channels above existing levels is expected to be low since roads would be used only under dry and frozen conditions and established vegetation on the road margins, sides of the road prism, and in ditches would be retained to filter and trap sediment.

Aquatic Organism Passage

Project design will address erosion and sediment delivery from the construction activities. All inchannel work will take place in the inwater work window to reduce sediment delivery downstream. Where needed sediment barriers will be placed around disturbed areas to prevent erosion into the stream channel. Excavation may be required for the lined dewatering channel in the floodplain. Excavation would not be conducted in the live channel to reduce resuspension of sediment. Machinery may cross streams only at designated temporary crossings

The environmental baseline for Sediment/Turbidity/Substrate Embeddedness will be **maintained** at the current level.

Chemical Contamination/Nutrients

The environmental baseline for this habitat indicator will be **maintained** at the current level.

All subwatershedsare rated FA for this indicator(Table 15).

The potential for a fuel spill is minimal. If pickup fuel tanks are used they are contained in the bed of the truck and secured. If fuel trucks are used the trucks are parked in designated industrial sites located at least 150 feet from a stream channel or flood prone area, or as far as possible from water bodies where local site conditions do not allow a 150-foot setback. This will minimize the potential for a fuel spill to reach a fish bearing stream. A Fuel Spill Prevention Plan is required for each commercial operation. This is incorporated into all timber sale contracts.

Physical Barriers

The environmental baseline for this habitat indicator will be **restored** to levels higher than the current level.

The Broady Creek, Davis Creek, and Sumac Creek subwatersheds are rated FAR (Table 15). The rating is based on four culverts that impede fish passage in Broady Creek and a single culvert in Davis Creek and a single culvert in Sumac Creek that block juvenile fish passage.

The installation of the culverts will produce short term sediment increases that could lead to adverse effects. Installation will follow the project design features that are recommended by the Project Design Team to reduce sediment impacts.

No physical barriers to fish migration will be created as a result of project implementation. No instream activities within fishbearing streams are proposed.

Large Woody Material (LWM)

The environmental baseline for this habitat indicator will be **maintained** at the current level.

The Broady Creek, Horse Creek, Lower Cottonwood Creek, Upper Cottonwood Creek, and Davis Creek subwatershedsarerated FA for this indicator, and the Rush Creek and Lower Swamp Creek subwatersheds are rated FAR, with the Cougar Creek, Sumac Creek, and Peavine Creek subwatersheds rated as Functioning at Unacceptable Risk (FAUR)(Table 15).

No project activites will reduce the amount of large wood in streams, or reduce large wood recruitment to streams. No instream actities are proposed that will remove large wood from streams. Project activities allowed within RHCAs includes fuels reduction handwork and stand improvement handwork, and treatment of category 4 RHCAs from 25 feet to 100 feet distance. The 25 foot variable width buffer on category 4 streams will retain large wood recruitment in the short term andfacilitate future large wood recrutiment in that area of treatment.Fuels reduction handwork and precommercial thinning handwork will maintain/enhance large wood recruitment. No overstory trees will be removed that could decrease large wood recruitment to streams. Benefits of precommercial thinning and fuels reduction thinning within RHCAs are discussed below.

Stand improvement thinning within RHCAs will reduce stocking densities in overstocked stands to reduce risk of disease and insect infestation leaving the healthiest and most vigorous trees that meet species and stocking requirements. This will result in larger trees with fuller crowns in the RHCA for stream shade and recruitment to stream channels and hillslopes for sediment retention and channel structure.

Homyack et al. (2004) found that stands thinned six to 11 years prior to the study had a greater overstory structure than similar untreated stands. In contrast, unthinned stands gained little overstory structure indicating that the application of stand improvement thinning was responsible for the accelerated height and diameter growth.

The most documented effect of stand improvement thinning is increased diameter growth caused by the redistribution of the environmental resources among a smaller number of selected trees. When the number of stems per hectare is very large, the leaf area of each tree could be so limited that few carbohydrates are available for height development and stagnation of growth occurs (Pothier 2002). Thinning early increases diameter growth and concentrates volume growth on fewer stems (Berg 1995). Silvicultural systemscan improve the overall vigor of some stream ecosystems and provide a long term supply of forest structural components for streams and riparian forests (Swanson and Berg 1991). Thinning stands adjacent to streams allows for the improvement of stand vigor without deleterious impact to aquatic production. Increased growth of selected trees to be retained improves future sources of large wood. Rentmeester (2004) conducted a thinning study focused on the production of snags as the primary recruitment mechanism along mainstem stream channels. Results indicate that silvicultural thinning resulted in increased diameter growth within residual trees. Faster diameter growth meant that trees were larger when they died and therefore the number of snags above the target diameter were greater. Abundance of large diameter snags increased by 20-74% under thinning scenarios relative to “no touch” silviculture.

Pool Frequency

The environmental baseline for this habitat indicator will be **maintained** at the current level.

There are no instream activities proposed that would remove large wood or other structure needed for pool maintenance or pool formation. No activities are proposed that would result in sedimentation to the point that pools would be filled in.

Pool Quality

The environmental baseline for this habitat indicator will be **maintained** at the current level.

There are no activities proposed that would remove or reduce the amount of large wood or other structure needed for habitat complexity in pools in fishbearing streams. There are no activities proposed in fishbearing streams.No activities are proposed that would result in sedimentation that will degrade pool quality. The replacement of culverts to provide for fish passage will not affect downstream pool quality. All culvert replacement activities will be performed within the instream workwindow during low flow conditions and will follow the project design criteria in to minimize the resuspension of inchannel sediment.

Off-Channel Habitat

The environmental baseline for this habitat indicator will be **maintained** at the current level.

All subwatersheds are ratedFAR for this indicator (Table 15).

There are no activities proposed that will alter off channel habitat. There are no activities proposed in fishbearing streams that will affect off-channel habitat. Minimum no activity stream buffers and distances to fishbearing streams will prevent effects to off-channel habitat.

Refugia

The environmental baseline for this habitat indicator will be **maintained** at the current level.

All subwatersheds are rated FA for this indicator (Table 15).

There are no project activities proposed in fishbearing streams that will affect refugia. Minimum no activity stream buffers on fishbearing streams and distances to fishbearing stream will prevent potential effects to refugia.

Width/Depth Ratio

The environmental baseline for this habitat indicator will be **maintained** at the current level.

All three subwatersheds are rated FA for this indicator (Table 15).

There are no project activities proposed that could potentially affect the width to depth ratio in streams. Minimum no activity stream buffers will prevent effects to streambanks that could potentially increase the width to depth ratio.

Streambank Condition

The environmental baseline for this habitat indicator will be **maintained** at the current level.

All subwatersheds are rated FA for this indicator (Table 15).

There are no project activities proposed that could potentially affectstreambank stability. Minimum no activity stream buffers will prevent effects to streambanks.

Floodplain Connectivity

The environmental baseline for this habitat indicator will be **maintained** at the current level.

The Peavine Creek, Cougar Creek and Sumac Creek subwatersheds are rated as FAR for this indicator, primarily due to the past impacts to Joseph Creek which is within the three subwatersheds. The remaining subwatersheds are rated FA (Table 15).

There are no project activities proposed that could potentially alter floodplain connectivity.

Road Density and Location drainage Network

The environmental baseline for this habitat indicator will be **maintained** at the current level.

The Davis Creek, Cougar Creek, Rush Creek and Horse Creeksubwatersheds arerated as FAR for this indicator, due to the elevated total road density (greater than 2.0 mi/sq. mi.) in the subwatersheds. Sumac Creek and Broady Creek subwatersheds are rated FUR due to the greater than 3.0 mi/sq. mi total road density.The remaining subwatersheds are rated FA (Table 20).

The implementation of the LJCRP will result in open and closed (total) road density for the subwatersheds that are are shown below in Table21 and 22.

Table 21. Total lengths (miles) and densities (miles/square mile) of roads in the Lower Joseph Creek Watershed following implementation of the project

Subwatershed Name	Drainage Area (mi^{i2})	Total FS Open Roads (mi)	Total FS Closed Road (mi)	FS Open and Closed Road Density (mi/mi^{-2})	FS Open Road Density) (mi/mi^{-2})
Broady Creek	21.19	19.4	29.1	3.02	1.21
Horse Creek	19.28	15.7	2.5	2.01	1.74
Rush Creek	32.01	11.3	11.4	2.57	1.28
Lower Cottonwood Creek	23.42	5.7	1.5	0.68	0.54
Upper Cottonwood Creek	21.11	14.4	11.4	1.35	0.75
Peavine Creek	23.01	12.0	13.4	1.45	0.68

Table 22. Total lengths (miles) and densities (miles/square mile) of roads in the Upper Joesph Creek Watershed following implementation of the project.

Subwatershed Name	Drainage Area (mi^{i2})	Total FS Open Roads (mi)	Total FS Closed Road (mi)	FS Open and Closed Road Density (mi/mi^{-2})	FS Open Road Density) (mi/mi^{-2})
Cougar Creek	20.99	27.5	25.5	2.61	1.36
Sumac Creek	17.37	31.3	15.3	3.11	2.09
Lower Swamp Creek	34.24	28.9	13.0	1.80	1.24
Davis Creek	16.81	26.4	4.4	2.48	2.13

There are 11 miles of road decommissioning planned in in LJCRP area: 5.9 miles in Broady Creek subwatershed; 1.2 miles in Cougar Creek; 1.8 miles in Davis Creek; 0.3 miles in Lower Swamp Creek; 0.9 miles in Peavine Creek; and 1.4 miles in Rush Creek.
Post project the Lower Joseph Creek Watershed will be at 1.82 miles/square mile total road density and Upper Joseph Creek will be at 2.43 miles/square mile total road density, slightly above the consultation target of 2.0 miles/square miles.

No new road construction is proposed with the LJCRP project. Temporary roads will be used and obliterated the same season of use.

Disturbance History/Peak Base Flows

The environmental baseline for this habitat indicator will be **maintained** at the current level.

No existingEquivalent Clearcut Acre analysis was performed for the LJCRP. Based on field observations the ECAs for the subwatersheds in the LJCRP area are all below 15%. The treatment prescriptions will not affect the ECA calculations as they are all thinning prescriptions that will maintain the current ECA values post project.

All subwatersheds are rated FA for this indicator (Table 20).

Riparian Habitat Conservation Areas

The environmental baseline for this habitat indicator will be**maintained**at the current level.

All subwatershedsare rated as FAR for this indicator (Table 20).

Forest treatments, stand improvement,and fuels reduction activities within RHCAs will improve the condition of RHCAs by thinning overstocked stands, which will, in the long term, increase large wood recruitment, and reduce the risk of insects and disease as well as reduce the risk of a high intensity fire.

Under the proposed action, RHCA buffer widths, as prescribed in PACFISH, would be utilized to protect aquatic and riparian habitats in the LJCRP area. These RHCA delineations would occur on Category 1, 2, and 3 streams, ponds and wetlands.

Category 4 RHCAs would be delineated as prescribed by PACFISH, but would have a silvicultural treatment within the RHCA that would be used to maintain and restore RMOs for the Category 4 stream and RHCA. No effect to stream temperature from the Category 4 RHCA treatments would be realized.

With no site specific stand data on category 1 and 2 RHCAs, there will be no harvest treatment proposed in any alternative for those RHCAs, except for Swamp Creek. Any proposed treatment prescriptions for category 4 RHCAs would follow a minimum 25 foot variable width no treatment buffer on either side of the channel. This would provide protection from equipment disturbance to the channel banks and maintain the existing supply of large woody debris to the channel. The treatment outside the no treatment buffer would follow the treatment prescription for the upslope area. The area from 25 to 100 feet is similar in species composition and stand structure, as well as the range of variation, to the upslope area. This treatment would provide the long term stand conditions for the RHCA to provide for the maintenance of the site specific riparian management objectives. This treatment would reduce the influence of uncharacteristic wildfire on stand structure and composition, and potentially reduce the effects of climate change on stand structure

(and in-turn stream flow), and the effects of insect infestations on the stand. Additionally, thinning would result in faster growth of residual trees due to reduced competition, thus increasing the size of potential large woody debris. In this manner it would provide for resilience to the vegetation in the likely event of future disturbance.

For all other Category 1 and 2 streams outside the treatment in Swamp Creek described above, restricting activities to areas outside of RHCAs would prevent adverse impacts to existing stream shading along perennial streams in the aquatic effects analysis area. The RHCA width adjacent to these streams, 300 feet for Category 1 streams and 200 feet for Category 2 streams, are sufficient to prevent removal of trees that provide stream shading. Therefore, measurable increases in stream temperatures would not result from proposed thinning activities.

The proposed forest treatment of 1822 acres of Category 4 RHCAs and 31 acres of Category 1 RHCAs and the stand improvement treatment of 749 acres of RHCA (primarily Category 4) will not move the habitat indicator in the treated subwatersheds

Disturbance Regime

The environmental baseline for this habitat indicator will beto **restore** to levels above the current level.

All subwatersheds are rated FARfor this indicator (Table 20).

The rating is based on the departure in the disturbance regime related to vegetation and the potential vegetation related to increases in catstrophic fire events and some increase in disease and insect infestations due to fire suppression activities.

Minimum no activity stream buffers will retain channel structure, large wood, and vegetation on streambanks needed to slow stream velocities and resist erosion. Implementation of the LJCRP will not result in an increase in scour events, debris torrents, frequent floods, drought, or channel simplification.

The proposed treatment of the forested stands (16,514 acres) and the prescribed fire treatment of high priority acres (48,600 acres) in the LJCRP will move the subwatersheds to a Functioning Appropriately (FA) rating over the course of the 10 year implementation. These treatments will reduce the gap in departure in PVGs.

3. *EFFECTS ON PRIMARY CONSTITUENT ELEMENTS (PCEs) FOR STEELHEAD*

Each of these elements is addressed by indicators in the matrix of pathways and indicators discussed in the indirect effects section.

Steelhead Critical Habitat PCEs

1. Freshwater Spawning Sites:

Substrate:is addressed by the *Sediment/Turbidity/Substrate Embeddedness*indicator.

Water Quality: is addressed by the *Temperature,Sediment/Turbidity/Substrate Embeddedness, and Chemical Contamination and Nutrients*indicators.

Water Quantity:is addressed by the*Change in Peak/Base Flows*indicator.

2. Fresh Water Rearing Sites:

Floodplain Connectivity:is addressed by the *Floodplain Connectivity*indicator.

Forage: The use of minimum no activity stream buffers that are based on the riparian microclimate will prevent effects to forage.

Natural Cover: is addressed by the *Riparian Habitat Conservation Areas, Large Woody Debris,* and *Pool Quality* indicators. The use of no activity stream buffers will prevent effects to natural cover.

Water Quality: is addressed by the *Temperature, Sediment/Turbidity/Substrate Embeddedness, and Chemical Contamination and Nutrients* indicators.

Water Quantity:is addressed by the*Change in Peak/Base Flows*indicator.

3. Freshwater Migration

Free of Artificial Obstruction: No physical barriers to fish migration will be created as a result of project implementation. No instream activities within fishbearing streams are proposed. Six fish passage culverts are proposed to improve this element.

Natural Cover: is addressed by the *Riparian Habitat Conservation Areas, Large Woody Debris,* and *Pool Quality* indicators. The use of no activity stream buffers will prevent effects to natural cover.

Water Quality: is addressed by the *Temperature,Sediment/Turbidity/Substrate Embeddedness, and Chemical Contamination and Nutrients* indicators.

Water Quantity:is addressed by the*Change in Peak/Base Flows*indicator.

D. EFFECTS ON ENVIRONMENTAL BASELINE

None of the proposed activities, either by themselves, or cumulatively, are expected to degrade the environmental baseline condition in the 10 subwatersheds for any of the matrix indicators. Two of the indicators will move to **restore** the environmental baseline; physical barriers, road density, and disturbance regime. All other indicators will be **maintained**.

E. INTERRELATED AND INTERDEPENDENT EFFECTS

Interrelated or interdependent actions associated with the LJCRP include extra traffic on closed roads opened for administrative use that could occur from the public using these roads. These roads are marked for logging use only, but the public travel these routes regardless. Effects to listed fish and fish habitat would be nonmeasurable from the extra traffic on closed roads opened for administrative use, a *de minimus* effect.

F. CUMULATIVE EFFECTS

The risk of adverse cumulative effects due to implementation of the LJCRP is discountable. The indicator matrix table (Table 20) shows that three indicators will be restored and all other indicators will be maintained with the implementation of this project. No non-federal actions, timber harvest, thinning, prescribed fire or road construction are anticipated to occur in the reasonable foreseeable future. The implementation of the LJCRP will not slow the recovery of streams or retard attainment of RMOs in either the Lower Joseph Creek or Upper Joseph Creek watersheds.

Determination of the Effect to Listed Fish Species

A. INTRODUCTION

After a determination of the direct and indirect risks to listed fish and their habitat indicators has been completed, the next step is to determine the actual effect that these projects will have on the listed fish. This analysis must involve a check of the existing baseline condition for the project areas, coupled with a specific analysis of the effects the projects may have on the life history of the listed fish. Guidance for making this biological determination was provided by *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale* (NFMS 1996). These methods were combined to provide a consistent approach for all listed fish species analyzed in this document.

B. SUMMARY OF DETERMINATION

Summer Steelhead and Designated Critical Habitat.

The implementation of the LJCRP**May Affect,** and is **Likely to Adversely Affect;**

- summer steelhead and designated critical habitat,

This determination was based on the following:

1) risk of indirect effects of treatment of 1822 acres of Category 4 RHCAs with 25 foot variable width no entry buffer;
2) replacement of six fish passage barriers located within occupied steelhead habitat;
3) risk of indirect effects of treatment of Category 1 RHCA on 31 acres in Swamp Creek;
4) low risk of direct effects to fish or designated critical habitat;
5) short term effects to three indicators(physical barriers, road density/location/drainage, and disturbance regime)based on the restoration actions.
6) Increase in total road density in Upper Joseph Creek Watershed from 2.18 mi/sq mile to 2.43 mi/sq mile.

Essential Fish Habitat (EFH)

The implementation of the LJCRP **May Affect,** but is **NOT Likely to Adversely Affect**Essential Fish Habitat for spring Chinook salmon**.**

This determination is basedon the same justification given above for listed fish species and designated critical habitat. And the distance downstream from the project area to essential fish habitat in the Grande Ronde River, over 10 river miles.

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APPENDIX

CONSERVATION MEASURES

Forest Treatments using Mechanical Treatment Methods

RHCAs will be implemented following PACFISH guidelines; 300 feet on fishbearing streams, 150 feet on perennial non-fishbearing streams, and 100 feet on intermittent non-fishbearing streams. These will be used on all commercial removal units and mechanical treatment units.

For treatment of 1822 acres of Category 4 RHCAs a 25 foot variable width buffer will be used where no activity will be allowed.

For treatment of the 31 acres of Swamp Creek Category 1 RHCA a 25 foot variable width buffer will be used where no activity will be allowed.

Timber haul will be restricted to dry or frozen ground conditions to prevent subsequent increases in sediment delivery to stream channels.

Following skidding, skid trails will be assessed and rehabilitated as necessary using methods that lifts, fractures, and replaces compacted soil to allow maximum infiltration of water and waterbars installed.

Skyline yarding units will have full suspension over RHCAs. No corridors are needed through the RHCA for removal of material since no treatment of RHCAs is proposed in the majority of skyline units. In most cases the cable can be raised without cutting trees in the RHCA. Occasionally a tree may need to be cut down to facilitate raising of the cable. Trees cut within the RHCA to facilitate raising of the cable would be left on site since there is no yarding within RHCAs.

Temporary roads will be built, used and obliterated within one operating season. This will include seeding to prevent erosion and subsequent sediment delivery.

A minimum of 80 percent of the project area will be left in a non-compacted, non-puddled, and/or non-displaced condition (FSM 2520.3, R6 Supplement #50).

Skid trails will be constructed at least 60 feet apart.The distance maybe greater depending on the type of equipment being used and site conditions.

Skid trails will be buffered with slash to minimize erosion and soil compaction.

Under saturated soil conditions no off-trail skidding or machine falling is allowed.

Timber Sale Administrators and Watershed Specialists will monitor all Forest Management projects to make sure they are meeting the general guidance criteria and project specific criteria.

Stand Improvement Thinning, Fuels Reduction,and Hand Piling and Burning Within RHCAs

For stand improvement thinning, fuels reduction, and hand piling and burning within RHCAs, minimum no activity stream buffers will be delineated following the Blue Mountain PDCs

No trees greater than nine inches dbh will be cut,all trees will be cut by hand, all slash will be hand piled and burned outside of minimum no activity stream buffers, no ground-based equipment will be used, and no mechanical treatment or mechanical removal will occur. Burn piles within RHCAs would be approximately four feet in height and six feet in diameter.

Prescribed Burning

Prescribed fire use will follow the Blue Mountains PDCs for buffers based on PACFISH categories.

In areas of high erosion hazard ratings (EHRs), burning will be restricted to ridgetops and slopes less than 35 percent.

Fuel moisture content, primarily of down large woody material, will be monitored prior to prescribed fire projects to minimize consumption. Fuel moisture contents will be 5–15 percent for fine fuels (grasses, and dead material less than ¼ inch in diameter), and 5–20 percent for fuels ranging from ¼ inch to one inch in diameter, as described in specific burn plans.

Chemical Contamination/Nutrients

If pickup fuel tanks are used they are contained in the bed of the truck and secured.

If fuel trucks are used the trucks are parked in designated industrial sites located at least 150 feet from a stream channel or flood prone area, or as far as possible from water bodies where local site conditions do not allow a 150-foot setback. This will minimize the potential for a fuel spill to reach a fish bearing stream.

A Fuel Spill Prevention Plan will be required for each commercial operation. This is incorporated into all timber sale contracts.

Culvert Replacement

Buffers
The Project Design Team (PDT) will recommend site-specific riparian buffers for specific activities to avoid delivery of sediment or contaminants to streams. The PDT may designate buffers of different widths for different activities such as site preparation, equipment work areas, equipment staging areas, equipment fueling and maintenance areas, earthmoving, and stockpile areas.

Low-water Work Windows
All projects will be conducted during low flow conditions, which typically occur from late summer through fall (specific low flow periods will be determined by a hydrologist). The State of Oregon will provide in-channel work window suggestions to avoid adverse effects to ESA-listed fish species for specific locations. All projects will be completed within one work season.

Fish Avoidance
A fish biologist or designee will conduct all of the following fish survey evaluations and work area clearing operations. A fish biologist willdirect or conduct a planning survey of the project stream during project planning to determine if ESA-listed fish species inhabit the project area. A fish biologist will attempt to clearthe area of fish before the site is dewatered and the flow is bypassed. This could beaccomplished by a variety of methods, including seining, dipping, or electroshocking, depending on specific site conditions. Under normal conditions, block nets will be installed, fish will be captured and relocated, streamflow will be diverted around the project area, and block nets will be removed all in the same day. On very rare occasions, block nets may remain in the stream overnight when the fish capture and diversion activities require additional time to complete. All handling of fish, using any method, will be conducted by or under the direction of a fisheries biologist, using methods directed by following the National Marine Fisheries Service (NMFS) Guidelines for Electrofishing Waters Containing Salmonids Listed Under the Endangered Species Act (NMFS 2000).

Pollution Control Measures Follow State Water Quality Guidelines (Clean Water Act)
Project actions willfollow all provisions of the Clean Water Act (CWA) and provisions for maintenance of water quality standards as described by Oregon Department of Environmental Quality (ODEQ). Programmatic projects will be in compliance with all applicable state and Federal laws and processes *(e.g.,* Section 404 permits).

Spill Prevention, Containment, and Reporting.
All vehicles carrying fuel will have specific equipment and materials needed to contain or clean up any incidental spills at the project site. Equipment and materials will be specific to each project site, and can include spill kits appropriately sized for specific quantities of fuel, shovels, absorbent pads, straw bales, containment structures and liners, and/or booms. Storing and refueling areas will be located in staging areas away from streams in areas where a spill would not have the potential to reach live water. Containment structures maybe necessary if prevention of spilled material from reaching live water cannot be assured. All pumps and generators used within PACFISH RHCAs (for administrative units operating within PACFISH direction), will have appropriate spill containment structures and/or absorbent pads in place during use.
Should quantities of stored fuel for a project exceed 660 gallons in a single tank; or exceed 1,320 gallons for all storage combined; contractors and agency operators will be required to have a standard Environmental Protection Agency (EPA) written Spill Prevention Control and Containment (SPCC) Plan onsite, which describes measures to prevent or reduce impacts from potential spills (from fuel, hydraulic fluid, etc.) (40 CFR 112, Oil Pollution Act relating to SPCC Plans). For all culvert projects which involve fuel storage and refueling actions conducted under this BA, a written spill plan is required. This spill plan shall be developed, recommended and/or approved by the PDT (or members thereof). The plan will contain a description of the specific hazardous materials, procedures, and spill containment that will be used, including inventory, storage, and handling.

Minimize Exposure to Heavy Equipment FuelOil Leakage.
Methods to minimize fuel/oil leakage from construction equipment into the stream channel include the following:
1)All equipment used for instream work will be cleaned of external oil, grease, dirt and mud, and leaks repaired, prior to arriving at the project site. All equipment will be inspected by the Contracting Officer's Representative before unloading at site. Any leaks or accumulations of grease will be corrected before entering streams or areas that drain directly to streams or wetlands;
2).Equipment used for instream or riparian work (including chainsaws and other hand power tools) will be fueled and serviced in an established staging area (site specifically recommended by PDT}. When not in use, vehicles will be stored in the designatedstaging area. The staging area should be in an area that will not deliver fuel, oil, etc. tostreams.
3)Oil-absorbing floating booms, and other equipment such as pads and absorbent

"peanuts" appropriate for the size of the stream, will be available on-site during all phases of construction. For very small streams with few pools or slack water, booms may not be effective. More pads and straw bales to anchor booms may be necessary. Booms will be placed in a location that facilitates an immediate response to potential petroleum leakage.

Aquatic Invasive Control Measures
To ensure that equipment is not contaminated, any visible plants, mud, and dirt will be removed by washing any equipment likely to come into contact with water offsite, well away from streams.Equipment will be dried thoroughly after decontamination.

Erosion Control Measures

Minimize Site Preparation Impacts
1)Site clearing, staging areas, access routes, and stockpile areas will be recommended by the PDT in a manner that minimizes overall disturbance, minimizes disturbance to riparian vegetation, and that precludes erosion into stream channels.
*2)*If trees need to be removed to facilitate culvert or bridge placement, they will be stockpiled for use in-channel rehabilitation.
*3)*When the PDT recommends that sediment barriers are necessary, barriers will be placed around potentially disturbed sites to prevent sediment from entering a stream directly or indirectly, including by way of roads and ditches.
4)A supply of erosion control materials *(e.g.* silt fence and straw bales) will be kept on hand to respond to sediment emergencies. Sterile straw or certified "weed free" straw will be used to prevent introduction of noxious weeds.

Minimize Earthmoving-Related Erosion
1*)*Additional sediment or erosion control barriers maybe recommended by the PDT once constructioncommences. These could include Sedimat, straw bale retentions, and off-channel sediment settling ponds. In-channel sediment abatement barriers will capture sediment that is liberated during rewatering of dewatered channels, barriers will be removed, and captured sediment will be disposed of so it is not reintroduced into stream channels. Such barriers will be maintained throughout the related construction and removed only when construction is complete and erosion control is assured.
2)Instream rocks or bedrock within occupied habitat should be broken without blasting, using non-explosive alternatives such as Betonamit (www .betonamit.co.za/). This noiseless, shock-free, non-toxic product is poured into pre-drilled holes and after a few hours exerts tremendous expansive pressure such that even the hardest rock will be broken into smaller more manageable pieces.
3)The PDT will delineate construction impact areas on project plans. Work will be confined to the minimum area necessary to complete the project.
4)A supply of erosion control materials *(e.g.J* silt fence and straw bales) will be used to respond to sediment emergencies. Sterile straw or "weed freeu certified straw bales will be used to prevent introduction of noxious weeds.
5)All project operations will cease except efforts to minimize storm or high flow erosion under precipitation and high flow conditions that result in uncontrollable erosion in the construction area.
6)Native streambed materials may be conserved and stockpiled above the bankfull elevation for later use in-channel rehabilitation and filling culverts. To prevent contamination from fine soils, these materials will be kept separate from other stockpiled material which is not native to the streambed. If a bridge or arch is being constructed, there may be no need to newly disturb native materials.

Minimize Temporary Stream Crossing Sedimentation
1)Stream channels in occupied habitat will be dewatered prior to heavy equipment operating within project sites.
2)Existing roadways or travel paths will be used to access or cross streams whenever reasonable.
*3)*In unoccupied habitats only, equipment will only enter the flowing water portion of the stream channel at designated temporary stream crossings (recommended by an aquatic specialist from the PDT).
4)Temporary crossings will not increase risks of channel re-routing due to high water conditions (unoccupied habitats only).
5)Temporary crossings shall be minimized and conducted at right angles to the main channel where possible.
6)Should the PDT determine during planning that the stream bottom needs further protection from channel disturbance and subsequent temporary sediment, temporary stream crossing structures such as rubber mats or temporary bridges may be implemented.

Minimize Sedimentation through Dewatering
1)In-channel project sites will be dewatered and completely bypassed prior to excavation.
2)Any water intake structure (pump) authorized under this proposed action will have a fish screen installed, operated and maintained in accordance with NMFS fish screen criteria (NMFS 2011a)
3)Flow will be diverted with pumps or structures such as cofferdams, constructed of non-erodible material, such as sandbags, bladder bags, or other means that divert water. Diversion dams will not be constructed with material mined from the stream or floodplain.
4)The temporary bypass system may be constructed with non-erodible material, such as a pipe or a plastic-lined channel, both of which will be sized to accommodate the predicted peak flow rate (including possible storm intensities) during construction. In cases of channel rerouting, water may be diverted to one side of the existing channel.
5). Flow will be dissipated at the outfall of the bypass system to diffuse erosive energy. The outflow will be placed in an area that minimizes or prevents damage to riparian vegetation. If the diversion inlet is not screened (to allow for downstream passage of fish), the diversion outlet will be placed in a location that facilitates safe reentry of fish into the stream channel (a fish biologist will oversee these measures).
6)When necessary, water from the dewatered work area will either be pumped to a temporary storage and treatment site, or into upland areas, to allow subsequent filtration through vegetation prior to water reentering the stream channel.

Flow Reintroduction
1)In perennial channels, the reconstructed stream channel will be "pre-washed" into a reach equipped with sediment capture devices such as Sedimat, prior to reintroduction of flow to the stream.
2)In perennial streams, the construction site will be rewatered slowly to prevent loss of surface water downstream as the construction site streambed absorbs water and to minimize a sudden increase in turbidity.
3)In-channel sediment abatement barriers such as Sedimat will capture sediment that is liberated during rewatering of dewatered channels, barriers will be appropriately cleaned out and removed, and captured sediment will be disposed of so it is not reintroduced into stream channels. Such barriers shall be maintained throughout the related construction and removed only when construction is complete and erosion control is assured.

Site Rehabilitation

1)Upon project completion, project-related waste will be removed. Rehabilitation of all disturbed areas will be conducted in a manner that results in conditions similar to pre-work conditions through spreading of stockpiled materials (large woody debris), seeding, and/or planting with native seed mixes or plants. If native stock is not available, soil-stabilizing vegetation (seed or plants) will be used that does not lead to propagation of exotic species.

2)For culvert removal or bridge projects, the stream channel cross-section and gradient will be reconstructed within the area formerly occupied by a culvert in a manner that reflects more natural conditions found upstream and downstream. Large wood and/or boulders may be placed in the reconstructed stream channel and floodplain (with approval by the PDT).

3)No herbicide application will occur as part of the permitted action.

4)When deemed necessary by the PDT or aquatic specialist, compacted access roads, staging areas, and stockpile areas will be mechanically loosened

5)Trees will be retained at project sites wherever possible. Instream or floodplain rehabilitation materials such as large wood and boulders will mimic as much as possible those found in the project vicinity. Such materials may be salvaged from the project site or hauled in from offsite but cannot be taken from streams, wetlands, or other sensitive areas.

6)Trees (greater than 8 inches diameter at breast height) will not be felled in the riparian area for site rehabilitation purposes unless necessary for safety. If necessary for safety, trees may be felled toward the stream and left in place or placed in the stream channel or floodplain when recommended by the PDT.

7)Site rehabilitation activities (with the exception of further years' seeding and revegetation) will be completed prior to the end of the current field season.